Aalto University
School of Business

FACILITATING DIGITAL INNOVATION THROUGH EMPLOYEE PROCUREMENT STRATEGY IN THE FINNISH PUBLIC SECTOR

Master's Thesis
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Abstract of master's thesis

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Strategic human capital sourcing literature has been published for several decades, but how and to what extent sourcing strategies impact digital innovation outputs has been studied very little. This master's thesis represents a research venture into that void. Specifically, this study focuses on how outsourcing, insourcing, and in-house outsourcing might impact a firm's ability to produce continued digital innovation in the Finnish business space. The project features two major parts. The first section of the study consists of an investigation into the academic literature surrounding digital innovation, human capital sourcing, knowledge management, and corporate boundaries. This review will serve to inform the project and generate theoretical background for the rest of the study. Then, the second section of the thesis will feature a quantitative study that examines how human capital sourcing strategy, specifically with regard to temporary and part-time employment impacts the digital innovation outputs of a national economy. Twenty-two member states of both the Organisation for Economic Cooperation and Development (OECD) and the European Union (EU) comprise the sample that is evaluated in the empirical, quantitative analysis.

The data relating to each sample aggregated for this project was collected from the OECD statistics database. Hypotheses, rooted in theory, were tested through linear regression modeling to determine the relationship between the independent variables of temporary employment, part-time employment, and job tenure less than three years, and the dependent variable, information communication technology (ICT) patent output. Testing the initial two hypotheses explores whether and to what extent there might be a direct relationship between temporary employment or part-time employment, respectively, and ICT patent output. Following the initial regression analysis, a multiple linear regression is applied to the latter two hypotheses where the same independent variables are once again evaluated, but with job tenure of less than three years added as a moderating variable in the regression model. Meanwhile, gross domestic product (GDP) per capita, total country employment, and year are all accounted for as control variables.

The findings herein suggest that there does in fact exist a positive, significant relationship between part-time employment and ICT patent output, while temporary employment does not yield similar findings. Further analysis of the control variables and their impact on the regression models, however, indicates that temporary employment, especially when moderated by short-term job tenure, does in the macroeconomic context generate a positive, significant effect on ICT patent output. Furthermore, it becomes evident that part-time employment loses its significant impact upon ICT patent output when incorporating the interaction term between part-time employment and short-term job term.

Key takeaways from this work demonstrate that both temporary employment and part-time employment facilitate greater ICT patent output; however, part-time employment combined with short-term job tenure does not provide the same findings. Additionally, the theoretical framework underscores the importance of ensuring that temporary or part-time laborers are included in the company structure and culture through strategic management directives. Finally, recommendations are provided to the partner organization sponsoring this thesis, the Finnish Digital Agency.

Keywords Digital Innovation, Human Capital, Sourcing, Finnish Digital Agency

Master's Thesis:

Facilitating Digital Innovation through Employee Procurement Strategy in the Finnish Public Sector

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1 Introduction

1.1 Thesis Topic

Digital innovation as the lead driver of every industrial vertical in the 21st century. As such, it is pertinent to both my academic and career goals that I develop a strong understanding of how digitalization is orchestrated both in the public and private sector. Current scholarly literature regarding digitalization is robust, but it nevertheless exhibits gaps in research related to how firms utilize specific strategies of human capital management to facilitate digital innovation (Nambisan, et al., 2017). Furthermore, the literature addresses, through both resource- and knowledge-based lenses, how the approaches of private sector and generalized ecosystems assist in the development of digital innovation; but it leaves unanswered many questions regarding the digitalization strategies of the *public* sector (Bertot, et al., 2016). Management frameworks are reported extensively throughout the literature, yet they do not adequately consider the role of public sector institutions in facilitating digital innovation. Ultimately, then, this project seeks to contribute fresh insights to the literature and assist the Finnish Digital Agency in implementing improved digital design management strategy.

In this thesis, I examine how various management practices surrounding sourcing procurement impact digitalization in the Finnish Digital Agency. Throughout this project, I will not only conduct in depth research but also will provide benchmarking, projections, and recommendations for the Finnish Digital Agency in a consulting-style deliverable. In order to meet this objective, I will study the digital tools utilized in this field and how they impact the outcomes of user experience as well as specific use contexts. Furthermore, this study will address the merging of organizational management strategy with digital products, platforms, ecosystems, and infrastructure. Finally, the aim of this project is to apply the research specifically to the needs of the Finnish Digital Agency regarding the digitalization of design systems in the public sector.

This study will pursue a deeper understanding of the theoretical models of sourcing strategy and digital innovation while also taking into account the application of corporate sourcing prerogatives in real-life business settings through the following research questions:

1. ***"How do companies' sourcing procedures impact digital innovation output of the firm?"***
2. ***"Do corporate boundaries, job tenure, and other elements of personnel utilization impact digital innovation output?"***

Functionally, these two research questions guide this study in its testing of the independent, dependent, and control variables that are addressed below in the methodology section of this report. Ideally, the study will provide comprehensive insight into the nuances of sourcing and knowledge procurement across industrial verticals in the Finnish public and private sectors that can later guide the strategic operations of the Finnish Digital Agency.

Scholarly literature to date addresses many tenets of sourcing and technological innovation, but important aspects of this topic remain unexplored. One such example comes from a paper published on the economic ramifications of global sourcing in high-tech industrial innovation outputs in the United States (Li, 2006). Further research engages with sourcing elements of corporate governance initiatives, niche market exploitation, and the outsourcing paradox (Mayer et al., 2012; Santos et al., 2009;Windrum et al., 2009). As such, an investigation specifically addressing the benefits and consequences of specific sourcing procurement models, especially in the Finnish public sector, would provide a valuable addition to the literature that currently exists.

Additionally, this study investigates sourcing strategy regarding both public sector organizations and private sector firms that they are tasked with supporting. Since, due to the international nature of the academic literature, national public and private sector firms are rarely addressed with regard to sourcing, this thesis will furnish both a thoroughgoing understanding of sourcing decision-making on a more macroeconomic level and assess the potential effectiveness of each of the strategic procurement method**s**. Lastly, while the vast majority of literature in the field of sourcing strategy and digital innovation relies upon a case-based, theoretical qualitative model of framework development, this thesis will also utilize quantitative data analysis to test its conclusions. In the end, the insights gleaned from this research will serve as recommendations to the Finnish Digital Agency about which human capital strategies most effectively drive success or foreshadow failure with regard to digital innovation.

1.2 Partner Organization

Through the Aalto Thesis Programme, the Finnish Digital Agency is sponsoring four students to collaborate on a multidisciplinary master's thesis project to address digital service offerings in Finland as it continues to facilitate digital innovation for both public and private sector organizations. The mission of the Finnish Digital Agency is to increase the overall digitalization of electronic services in Finland, especially for entities that are defined as vital for society (Population Register Center, 2019). In addition to assisting in the digitalization of Finnish industry, the organization is responsible for making Finnish citizen data available in electronic formats in order to streamline various bureaucratic procedures, including becoming a citizen of Finland or registering as a foreign exchange student (Aitonurmi, 2019). Currently, the Finnish Digital Agency is the most digitally innovative public sector entity in the European Union and has the goal of becoming over the next five years the most innovative in the (Aitonurmi, 2019). In an effort to achieve this goal, the Finnish Digital Agency has partnered with the aforementioned team of four students from Aalto to examine possible ways to improve the digital capabilities of the organization. Each of the students, two coming from the Aalto School of Business and two from the Aalto School of Arts, Design, and Architecture, will develop an individual thesis that furthers the vision of the Finnish Digital Agency. In May of 2020, the four students will produce a comprehensive proposal and roadmap for the achievement of the Finnish Digital Agency's goals.

1.3 Structure of the Thesis

The structure of this thesis will follow the suggested guidelines delineated by Aalto University and the Aalto School of Business. Following the abstract and introduction where the project is summarized, introduced, and outlined, there will be a background section that provides and in-depth literature review on the research topic and adjacent subjects as well as a theoretical framework that justifies the quantitative study design and associated hypotheses. The methodology, empirical analysis, and findings sections will immediately follow, which provide the specifics of the research study design, execution, and discovery. Additionally, a limitation section as well as a discussion section will be included to further analyze the strengths,

weaknesses, and ramifications of the findings associated with the study. Conclusions and recommendations are offered at the end as a means of providing future guidance for the partner organization, the Finnish Digital Agency.

1.4 Timeline of Project Completion

Table 1: Project Plan

Date	Thesis Project Action
4 October 2019	Initial meeting with thesis supervisor, Professor Henri Schildt
28 October 2019	Initial meeting with program coordinators
6 November 2019	Initial meeting with partner, Finnish Digital Agency
8 November 2019	Meeting with Aalto Thesis Student Team to determine project scope
15 November 2019	Continue literature review
30 December 2019	Finalize initial literature review
5 January 2020	Begin research study design (variables, quantitative analysis, etc.)
22 January 2020	Two-month update with partner
January-February 2020	Execute quantitative analysis work and respond to the recommendations of the client accordingly
March 2020	Four-month update with partner and compiling of initial findings after executing quantitative analysis work
April 2020	Begin to finalize the thesis research paper and client consulting reports as individual documents after drawing conclusions and providing results
15 May 2020	Final presentation to Finnish Digital Agency
30 May 2020	Final due date of Aalto Thesis deliverable

2 Background

2.1 Literature Review

Initially, this section investigates digital innovation and sourcing to develop a concrete theoretical background. After discussing these foundational literatures, I introduce complementary literatures, including the knowledge-based view of the firm, knowledge management, corporate boundaries, and the "gig-economy". This provides insights into the justification for implementing specific sourcing strategies, such as outsourcing.

2.1.1 Digital Innovation Strategy

Digital innovation, defined as utilizing technologies to facilitate the development of updated or proprietary product or service offerings, frameworks, or methodologies for the purpose of bettering fiscal or societal outputs of a firm, has become an increasingly important topic in academic literature since the advent of the digital enterprise. Enabled by the rapid feedback loops provided by digital technologies, firms are now able to capitalize on stakeholder engagement to better assist in providing effective products and services to consumers. This process of applying digital technologies and advancing innovative practices is driven by the human capital element that exists with the firm. As such, digital innovation is a derivative output of the strategic sourcing initiatives implemented by both public and private enterprises.

In the field of digital innovation, scholarly discussions have addressed frameworks and ecosystems that foster increased or decreased innovation paradigms. Management frameworks have been provided in numerous formats for the purpose of taming the highly dynamic process of digital innovation (Hinings et al., 2018; Nylén and Holmström, 2015). Some of the frameworks encourage outsourcing of digital services to facilitate surges in innovation while others more strongly rely on insourcing, or in-house development projects (Nambisan et al., 2017). User experience and value proposition are two key elements addressed in almost every piece of literature in the field. Consideration of these two fundamental areas is vital for understanding how to orchestrate a strong culture of digital innovation through management practices (Nambisan et al., 2017). The literature also provides some—albeit limited—insights into how governments and public sector agencies can assist in facilitating digital innovation

(Bertot, et al. 2016). In addition to the presence of extensive framework provision, the literature provides a comprehensive background on the nuances of digital innovation regarding rapid scalability, decreased barriers to stages of innovation, and infrastructure enabling quick, large-scale product or service dissemination (Nambisan, et al., 2017).

Although the literature provides strong definitions of digital innovation and frameworks for facilitating growth, there remain very few studies of managerial framework that use cases in context. As such, this thesis will require proprietary data analysis in order to quantify how successful these frameworks actually are in increasing digital innovation. In summation, the scholarly discussion regarding digital innovation is strong, but there are a number of niche research gaps that provide an opportunity to engage in fairly proprietary research. The research questions denoted above will be both supported by background literature and, ultimately, provide a contribution to the scholarly discussion as some of the research gaps are bridged.

2.1.2 Sourcing

There is an extensive literature that exists regarding the sourcing of human capital for multinational corporations (MNCs); however, this literature does not explicitly address more localized firms or government-funded, public sector entities. Furthermore, the core focus of this literature lies in addressing the location of production, generally, with the vast majority of research initiatives accounting for the geographical distribution of firm assets rather than the specific human capital that drives its core competencies. The two major sourcing strategies that are discussed are outsourcing and insourcing, both of which possess a robust literature. An alternative to these two sourcing strategies exists as well, however, and it is one that represents an alternative that offers potential benefits: in-house outsourcing. Let us examine each of these in order, beginning with outsourcing.

Researchers define outsourcing as shifting business operations that require little strategic oversight to geographical locations where cost benefits may be recognized (Quinn and Hilmer, 1999). Moreover, this technique of sourcing allows for MNCs to focus on core competencies and thus maximize the value creation potential that can be later offered to the firm's customer base. The goal of this strategy is to increase the competitiveness of the MNC and, in turn, gain a

competitive advantage (Quinn and Hilmer, 1999). Due to the longevity of the research surrounding outsourcing, opinions on its efficacy have shifted over the past two decades between both support and opposition. Arguments supporting outsourcing tend to be derived from this idea of maximizing profits through focusing on core competencies; the general focus here is that firms focus on development while allowing cheap labor to engage in the operations or production required in provision of products or services (Globerman and Vining, 2017). Additionally, this field of research evaluates how firms can reduce direct operating costs through outsourcing initiatives by utilizing theory derived from work on transaction cost economics (TCE) (Windrum, et al., 2009). On the contrary, researchers who adopt a knowledge-based view of the firm tend to recognize that outsourcing has a negative impact on innovation due mainly to the fact that outsourcing breeds a disconnect between operations, or production, and development (Mayer, et al., 2012; Li, 2006). Ultimately, the literature suggests that, although outsourcing may lead to the maximization of short-term profits, the long-term effect of human capital deterioration must not be ignored. This is also known as the "outsourcing paradox", which warns against the dangers of wholesale outsourcing and the associated negative consequences on innovation growth and total firm productivity (Windrum, et al., 2009).

A second strategic method for sourcing labor is insourcing, i.e., utilizing in-house human capital to execute business development and operations. The outsourcing movement among MNCs peaked in the 1990s, while the decades since have seen a shift back toward the utilization of domestic, in-house labor for both development and operations. The reason for this shift lies in the premise that rapid feedback loops from consumers to engineers to producers are only possible when the entire cycle resides within close geographic and organizational proximity (Fishman, 2012). Additionally, proponents of insourcing suggest that this can increase the quality of products, improve employee skill development, facilitate knowledge-based learning, and ensure that product lines do not become overly homogenized (Fishman, 2012). Although numerous firms continue to engage in outsourcing, it is becoming more apparent that absolute outsourcing has negative effects on knowledge creation and learning within the firm . In turn, insourcing has become a much more attractive form of human capital procurement as the negative latent, long-term effects of outsourcing have begun to surface (Fishman, 2012).

In addition to insourcing and outsourcing, a third compound method of human capital procurement and management strategy has emerged that is known as in-house outsourcing. This managerial strategy utilizes "under-the-same-roof outsourcing" as a means of acquiring the skilled human capital necessary to drive production initiatives while maintaining the oversight and feedback loops that lead to improved quality standards of the given outputs (Bonazzi and Antonelli, 2003). The quintessential element of this model is the spatial proximity of the company to the outsourced supplier that is operating within their physical parameters and, in turn, under the governance mechanisms established by the focal firm. Currently, the Finnish Digital Agency utilizes a similar sourcing mechanism by hiring third-party developers to come work in-house for the firm in addition to insourcing much of their work (Aitonurmi, 2019). At present, this provides the Finnish Digital Agency the opportunity to rapidly pivot on development initiatives as real-time information feedback loops are completed and, in turn, provide digital service offerings that are needed in the Finnish business space with rapid speed. This form of sourcing is similar to in-house outsourcing and is referred to as "incomplete re-contracting," which, as the name suggests, encourages continual innovation by withholding indefinite contracts with which many firms are burdened when onboarding fulltime employees (Bonazzi and Antonelli, 2003).

Each of these three human capital sourcing strategies provide favorable arguments while maintaining their own limitations, but the current literature suggests that, when it is possible, in-house outsourcing can combine the benefits of both insourcing and outsourcing to provide the most beneficial, comprehensive strategy for procuring human capital. This remains especially true in the information systems literature where software product development requires a rapid, healthy feedback loop to ensure that the highest standard of development and operational integrity is upheld.

2.1.3 Knowledge-based View of the Firm

To adequately grasp the strategic decision-making of digital innovation-based firm managers, one must first understand the knowledge-based view doctrine that governs much of the field's literature. This knowledge-based view is rooted in the premise that digital innovation at the firm level is derived from not only the knowledge that exists within the human capital but also the

ability of the firm to recombine current capabilities to improve innovation outputs (Kogut and Zander, 1992). Traditional literature regarding innovation has relied heavily on the resource-based view of the firm, or rather what assets a firm has in its possession to produce proprietary goods or services; with the rise of heavily digitalized corporations over the past two decades, however, this has shifted toward a knowledge-based view of the firm (Halawi, et al., 2005). This paradigm shift on where the catalyst of innovation lies has pushed researchers to recognize the importance of firm-level knowledge as the most valuable element in exploiting individual core competencies.

This conceptual paradigm accounts for much more than simply the raw materials to which a firm has access including social networking capabilities, strategic alliances that facilitate intellectual property sharing, and co-creation of value between various entities within the value chain. Chiefly, the social network capabilities are viewed as incredible assets in this framework due to the extensive partnerships and synergetic relationships that can be derived from them (Hayter, 2016). In addition, implementing these social network capabilities enables firms to strategically share intellectual property among their human assets in such a way that they may more rapidly and effectively improve the products or services they offer their customer bases (Nonaka and Toyama, 2015). Lastly, co-creation of value relies upon the local firm and one, or many, stakeholders engaging in cooperative initiatives to further develop mutually beneficial products or services. Within the knowledge-based view, stakeholders can utilize their combined informational assets to address problems that may be unique to only one entity and, as such, the knowledge itself becomes the fundamental asset that is shared (Kazadi and Mahr, 2016). This facet of the knowledge-based view has become one that is integral in innovation research across industrial verticals and the product versus service divide. In turn, the knowledge-based view literature is crucial in developing strategic recommendations for the Finnish Digital Agency since it is almost entirely engaged in providing digital service offerings that require the co-creation of value from the consumers of their services.

2.1.4 Knowledge Management

Knowledge management (KM) constitutes a sub-genre of the literature that falls under the purview of the knowledge-based view paradigm in which firm-level knowledge serves as the

driving catalyst for continual innovation. This literature signals the intersection of several key academic fields surveyed in this thesis: innovation, human capital sourcing, and strategic management. Since its rise to popularity in the mid-1990s, knowledge management practices have been implemented in firms ranging from small-to-medium-sized enterprises (SMEs) all the way up to major MNCs (Donate and Pablo, 2015). These strategic management practices have demonstrated an ability to help firms "improve the efficiency of business processes, increase the productivity and quality of their services, and find new solutions and products for their customers" (Nguyen and Muhammad, 2011). This remains especially true in highly digitalized firms and, in turn, remains an integral element of this thesis as the Finnish Digital Agency embodies this organizational identity. KM can help agency leaders maximize the effectiveness of their human capital resources, who in turn foster continued and nuanced digital development. Thus, the Knowledge Management framework can afford the Finnish Digital Agency supplementary strategies for achieving its goal of being the most digitalized and innovative public sector entity in the world.

Furthermore, the Finnish Digital Agency has a directive to bridge the social and economic divides in the Finnish socioeconomic space through continued collaboration between citizens and business entities (Aitonurmi, 2019). The knowledge management literature explicitly addresses the dynamic challenges that firms face due to the disconnect between economic and social drivers. The modern corporation must mold itself to the social environment in which it operates while maintaining fiscal and operational efficiency. Scholars describe this as creating "shared value" (Kramer and Porter, 2011). This deeply rooted business premise requires an active interaction between the firm and stakeholders, including the consumer base, where the co-creation of value occurs through mutual experience (Prahalad and Ramaswamy, 2004). In this model, knowledge management accounts for both the informational assets held by the firm and the knowledge generated from stakeholder feedback that can facilitate further innovation. Moreover, the literature reports that this absolute bridging of social and economic motivations has yet to be actualized and so suggests that further implementation of knowledge management possesses the ability to assist in further bridging the gap. Specifically, the idea that an organization should focus on learning by combining knowledge, organizations, people, and technology is promoted in this literature (Caputo, et al., 2019). Overall, the knowledge

management literature combines a number of research fields that contribute to the goals of the Finnish Digital Agency as denoted in their mandate and, as such, is extraordinarily pertinent to this thesis work.

2.1.5 Corporate Boundaries

For a firm to remain operationally efficient in any given space, it must first determine the boundaries inside which it will operate. The boundaries defining a firm's directive or mission can have a significant impact on the procurement or strategic sourcing initiatives in which it engages. This requires an evaluation of the firm's mission and scope, assets under management, and access to resources (Santos and Eisenhardt, 2009). Due to the vital nature of this theoretical understanding, the corporate boundaries literature is fairly robust with a focus on four central elements: first, cost efficiency facilitating the creation of boundaries; secondly, power as a means of establishing the realm in which a firm operates; thirdly, competence functions in conjunction with available resources and capabilities to determine where the firm will operate; and, lastly, identity as a driver for the definition of what will do operationally (Santos and Eisenhardt, 2009). This literature is highly relevant to the directive of the Finnish Digital Agency as a public entity to enrich private sector firms and improve the ease of access to information for the Finnish public simultaneously. When strategic conceptualization of strategy occurs later in this process, it will be vital to understand where the corporate boundaries of the Finnish Digital Agency lie and, especially, what the limitations on resources and competences are for the public enterprise.

Another element of the corporate boundary literature relates to nascent markets, or those markets that maintain a high level of ambiguity with regard to undefined industry structure (Santos and Eisenhardt, 2009; Rindova and Fombrun, 1999). Digital innovation, by nature, is a disruptive phenomenon that leads to significant market ambiguity and shifts in market-dominating leadership. As such, the Finnish Digital Agency is subjected to operating in an industry that will continue to be reshaped and molded in a manner that defines it as ever evolving. This is even further exacerbated with the responsibility of the Finnish Digital Agency to assist entrepreneurial growth in Finland, which requires a firm to be nimble and flexible in adjusting and expanding the boundaries of its operational scope and purview. This element of the Finnish Digital Agency's role in the Finnish business space is to enable social networking ties between investors

and the entrepreneurial entities, which the corporate boundaries literature considers absolutely vital (Santos and Eisenhardt, 2009).

Lastly, modern corporate boundaries research is highly correlated with that of knowledge management and also comes under the purview of the knowledge-based view paradigm. It is evident that firms, especially those with the task of facilitating economic and social growth in the public sector, must cross the traditional boundaries set between shareholders and stakeholders. This is highlighted in the corporate boundaries literature relating to corporate social responsibility (CSR) and the impact that it will have upon shaping future corporate boundaries (Murcia, 2016). Additionally, this impacts the sub element of human capital retention and the firm's investment in its employees through strategic management practices, thus connecting the literature back to sourcing strategy. Ultimately, we find that corporate boundaries dictate not only the natural resources and processes with which the firm interacts but also the human capital and societal elements that impact the business operations of a firm.

2.1.6 "Gig-Economy"

The "gig-economy", composed of micro-outsourcing employment contracts, has been on the rise over the past decade, especially in more developed countries throughout the western world. A robust literature exists that defines and discusses its existence. A "gig-economy" is one that relies on two fundamental elements of human capital utilization: "crowdwork," or completing tasks via online platforms; and "work-on-demand via app", or executing tasks through a series of applications that are managed by central firms overseeing quality standards and procurement strategy (De Stefano, 2015). This expansion of applications and platforms that enable the "gig-economy" has given rise to a multitude of entrepreneurs including Air BnB hosts, Uber drivers, or Postmates delivery people (Burtch, et al., 2018). This also impacts the number of people who are registered as part-time or temporarily employed in the economy. Each person can fall into one of these categories as well as being identified as "self-employed" (Petriglieri, et al., 2019). Naturally, this paradigm shift in employment structure has far-reaching consequences at both the firm and national level. Research suggests that there is a tradeoff of employment security for flexibility and autonomy that has significant implications for both employees and the overarching labor market (De Stefano, 2015).

Additionally, there are scholarly disagreements regarding the impact of the "gig-economy" on entrepreneurial activities. Some have argued that the rise of easy-to-use platforms has enabled nascent entrepreneurs to strategically grow their business operations in the market (Agrawal, et al., 2018). On the contrary, other scholars have suggested that these platforms enable lesser qualified entrepreneurs to seek alternative unemployment as they are currently un- or under-employed, thus leading to weak or stagnant entrepreneurial activities (Burtch et al., 2018). This also skews national employment statistics by incorrectly categorizing members of the workforce as self-employed rather than accurately identifying them as temporary or part-time employees.

2.1.7 Summary

Throughout this literature review, a number of academic fields are surveyed; however, each of the four literatures is integral to the process of developing a comprehensive understanding of digital innovation and the most effective sourcing of human capital to facilitate its continual growth. The vast majority of digital innovation literature falls under the knowledge-based view paradigm and the firms engaging in rapid digital innovation clearly utilize knowledge management practices to maintain a competitive advantage. Additionally, corporate boundaries define the nature of a firm's functional operating purview and, in turn, how strategic management practices are delineated in any given corporate directive. In conclusion, the literature provides a clear understanding of how sourcing strategy has developed over the past few decades, but it fails to establish whether or not any one of these sourcing alternatives provides stronger innovation rates within the current digital context. Thus, the question remains: "What is the most effective means of sourcing human capital to facilitate digital innovation?" The following pages will investigate viable and effective sourcing strategies.

2.2 Hypotheses

The hypotheses below are derived from the relevant literature and are formulated to guide this empirical study design in the following methodology section:

Hypothesis One

H_0: The greater use of temporary employment in a country does not impact the annual output of patents in information communication technologies.

Ha: The greater use of temporary employment in a country is positively related to a greater annual output of patents in information communication technologies.

Hypothesis Two

H_0: The greater use of part-time employment in a country does not impact the annual output of patents in information communication technologies.

H_a: The greater use of part-time employment in a country is positively related to a greater annual output of patents in information communication technologies.

Hypothesis Three

H_0: Job tenure does not moderate the effect of temporary employment on country information communication patent output.

H_a: Job tenure moderates the effect of temporary employment on country information communication patent output, such that the positive effect of temporary employment on country information communication patent output is stronger when job tenure is high rather than low.

Hypothesis Four

$H_{0:}$ Job tenure does not moderate the effect part-time employment on country information communication patent output.

$H_{a:}$ Job tenure moderates the effect of part-time employment on country information communication patent output, such that the positive effect of part-time employment on country information communication patent output is stronger when job tenure is high rather than low.

2.3 Theoretical Framework and Hypotheses

Even a brief survey of the literature related to this topic readily demonstrates the conflicting beliefs proponents hold regarding how employment strategy impacts digital innovation output. Literature relating to the "gig-economy" suggests that labor flexibility enables further entrepreneurship and innovation (Agrawal, et al., 2018). On the contrary, literature relating to the temporary employment and product innovation nexus suggests that non-traditional contractual

employment hinders innovation (Cetrulo, et al., 2018). As this work aims to address digital innovation that relates more directly to service provision and user experience development, the hypotheses tested here are based in the theoretical belief that temporary and part-time employment, in fact, foster stronger innovation output.

Due to the fact that this study evaluates a macroeconomic view of employee procurement, national temporary and part-time employment percentages will be used as independent variables rather than specific procurement methods (i.e. outsourcing, insourcing, etc.). Research suggests that the "need to continuously generate new or transform existing knowledge as a strategy to gain competitive advantages" remains at the forefront of employment strategy (Schmidt, et al., 2014). One such method of ensuring that knowledge is systemically generated or transformed is derived from the onboarding of new human capital. Temporary and part-time labor permits the onboarding of new employees while maintaining cost-effective management practices as prescribed in the lean methodology (Freire and Alarćon, 2002).

Literature containing research on digital innovation, sourcing, and knowledge management features a strong contingent who insist that temporary or part-time labor directly contributes to innovation. Drawing from this literature, this study will compare and evaluate the direct correlations between temporary or part-time labor and information communication technology patent output, which acts as a proxy variable for digital innovation. Additionally, job tenure is used as a moderating variable in the latter hypotheses of this study to account for all employment contracts that last less than three years. When the moderating variable is combined with each respective independent variable in a hypothesis, an interaction term, which accounts for both temporary or part-time employment as well as length of contractual job tenure, is generated. The theoretical ramifications of this interaction term are that the regression outputs account for contracts, whether temporary or part-time, that last less than the specifically denoted three years. In turn, this work is able to determine how job tenure and employee turnover directly impacts digital innovation outputs.

Hypothesis one (H1) states that temporary job tenure has a positive effect on ICT patent output while accounting for all of the control variables in the model. Since whether or not this is the

case remains disputed in the literature, this study will apply multiple linear regression modeling in an effort to better understand this dynamic. The second hypothesis (H2) follows the same general structure as the first hypothesis, except that here part-time employment will serve as the independent variable to determine the relationship between part-time employment and ICT patent output on the macroeconomic country level. Since, as noted earlier, the literature relating to part-time employment suffers from significant research gaps, one of the aims of this study is to fill some of the voids in the literature.

Juxtaposed with the initial two hypotheses, hypothesis three (H3) employs a multiple linear regression model with a short-term job tenure, defined as contractual job tenure less than three years, as a moderating variable. Hypothesis three states that short-term job tenure moderates the relationship between temporary employment and ICT patent output, such that the positive effect of temporary employment on country information communication patent output is stronger when job tenure of less than three years is high rather than low. Testing this hypothesis will provide insight as to how the independent and dependent variables interact when there is a maximum determined length of contract accounted for in the model. Methodologically, this will ensure that the findings demonstrate that short-term contracts either encourage digital innovation or, on the contrary, deter digital innovation, specifically in the ICT sector. Once again, the regression model utilized in hypothesis testing will account for the control variables denoted above.

Lastly, hypothesis four (H4) asserts that job tenure moderates the effect of part-time employment on ICT patent output, such that the positive effect of part-time employment on national information communication patent output is stronger when job tenure (percentage less than three years) is high rather than low. This hypothesis aims to investigate the relationship that short-term, part-time labor has on digital innovation output rather than simply part-time labor. This relationship is evaluated through multiple linear regression modeling and testing. The model also accounts for all of the control variables in the previous hypotheses. I have provided the conceptual model of the hypotheses here below.

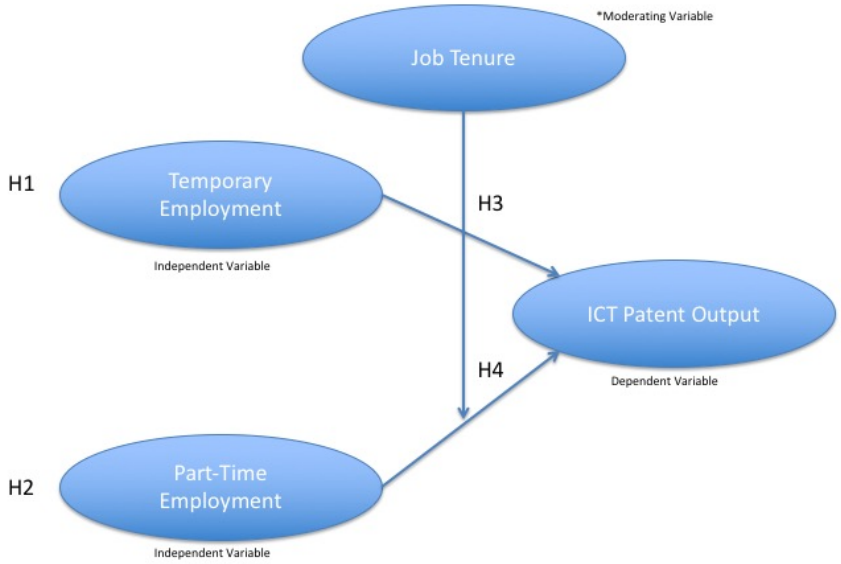

Figure 1: Model of Hypotheses

Each of the variables included in the hypotheses above are constructs that are discussed in the literature. Naturally, there are many additional dynamics that are not addressed in this study; however, the conceptual hypothesis modeling is structured in such a manner that it will provide insights into the direct relationships between the independent, moderating, and dependent variables. Consequently, the study will explore the role of the independent and moderating variables in the regression modeling more deeply in the discussion section of this thesis following the initial empirical analysis and findings.

The theory supporting this empirical, quantitative research study suggests that there will be adequate support for each of the hypotheses above; however, the literature provides a significant amount of dissention toward the idea that alternative contractual employment incites greater innovation output. Ultimately, this empirical study will contribute to the literature on this topic by providing an analytic interpretation of macroeconomic data related to employee sourcing, knowledge management, and digital innovation.

3 Methodology

3.1 Research Design

The general research study design for this thesis project is of a quantitative nature. Utilizing preliminary in-person interviews and longitudinal, archival data, I engage in various data analysis operations to determine how employee sourcing strategy impacts digital innovation outputs for Finnish firms in both the public and private sectors. The initial interviewing process takes place with employees of the Finnish Digital Agency to better understand employee procurement methods and strategy. Next, I collect longitudinal, archival data ranging from 2007 to 2016 that will provide the necessary *N*-value to test my variables in the data analysis stage and ensure statistical significance. Specifically, the study utilizes a number of preliminary data analysis functions conducted with IBM SPSS software followed additional applications of linear regression analysis using the same software. Thus, both theoretical (derived from background literature review) and data-driven (examined through quantitative analysis) concepts form the basis of the comprehensive research design employed in this study.

3.2 Variables

The variables that are evaluated are listed below. Each of the independent and dependent variables are directly related to the hypotheses presented in the theoretical framework. The control variables used here, however, are intended to increase the robustness of the empirical study. ~~Primarily~~ The first of these, gross domestic product (GDP) per capita, is utilized as a control variable for the purpose of accounting for the size and power of a given economy. This ensures that during hypothesis testing the results are not skewed due to fundamental differences in the composition of a country's macroeconomic structure. Secondly, this work retains total country employment as a control variable, thus ensuring that country employment statistics are considered in the model. Lastly, a dummy variable is created for specific year to ensure that global economic trends from one year to the next are accounted for (i.e. 2008 economic crisis, etc.). Additional specifics regarding the variables are included in the measures section of the empirical analysis later in this work.

Independent Variables

- Permanent Employment (%)
- Temporary Employment (%)
- Full-time Employment (%)
- Part-time Employment (%)
- Job Tenure (% < 3 years)
- Public Employment (%)

Dependent Variables

- ICT Patent Output (Total)
- ICT Patent Output/1000

Control Variables

- Size of GDP (USD)
- Total Employment (#)

Dummy Variable

- Year (2007-2016)

3.3 Sample and Population

This study aims to evaluate sourcing strategy in the Finnish public sector. As such, the generalizable population of this study is going to be twenty-two countries that are both European Union and Organisation for Economic Cooperation and Development (OECD) member states. To ensure that the results of the study are generalizable and externally valid, countries will be randomly collected (see research design above) from the population of the EU and the overarching sample size will be twenty-two while utilizing longitudinal data from 2007 to 2016 to ensure that the N=220, thus providing statistical significance to the results. This will assist in assuring that the results of the study are both statistically significant and theoretically sound. The specific data has been compiled from the OECD Statistics database. I combined a number of pertinent datasets into one master dataset to execute this study with the same twenty-two countries during the period of 2007 to 2016 remaining constant across all of the data.

3.4 Research Setting

The empirical setting for this quantitative thesis is based in two geographic locations: the Aalto University Business School located at Ekonominaukio 1, 02150 Espoo, Finland and the Finnish Digital Agency located at Lintulahdenkuja 4 00530 Helsinki, Finland. As this piece of research is a master's thesis, the vast majority of the background research, data collection, and empirical analysis was conducted within the Aalto School of Business while utilizing resources provided to

Aalto students. Preliminary interviews, workshops, and partner organization meetings were held in the Finnish Digital Agency office as a means of better understanding the internal operations and employee relations within the Finnish Digital Agency.

While writing this thesis and conducting research at the Aalto School of Business, I had frequent meetings with my three thesis team members to discuss the progress of our research and data collection initiatives. Our thesis team also held several meetings with the Aalto Thesis Programme coordinators to ensure successful team cooperation and effectiveness. Additionally, I met with my thesis supervisor, Dr. Henri Schildt, to discuss the procedural and substantive content of the thesis with regular frequency.

In addition to working with various people at the Aalto School of Business, my team and I met with a number of employees from the Finnish Digital Agency to discuss a wide range of topics that relate to Finnish Digital Agency operations, functions, and goals. The partner organization played a major role in helping us to formulate topics through extensive initial guidance and periodic feedback sessions.

3.5 Research Ethics

The ethical issues related to the conducting of this thesis are highly limited due to the nature of quantitative research studies involving archival data. Aside from initial in-person interviews with the partner organization's management, there was no data collection involving human subjects. Additionally, the preliminary interviewing involved a seminar style question and answer with several of the Finnish Digital Agency employees, which ensured that the interviewees were not subjected to any stressful or complicating scenarios. Ultimately, there was no need for Institutional Review Board (IRB) approval or training prior to engaging in conversation with the partner organization.

Additionally, the structure of the Aalto Thesis Programme ensures that the master's students and partner organization have a healthy dialogue that facilitates openness and understanding from the inception of the project through its completion. All parties involved are subject to an ethical and

practical contract ensuring that both the students and partner organization fully cooperate and fulfill their expected roles through the master's thesis process.

3.6 Analytical Approach

To test hypotheses 1 and 2, I utilized a multiple linear regression that accounted for the dependent, independent, and control variables. In order to execute this multiple regression, I used the IBM SPSS software to derive an understanding of the relationship between the independent (ICT Output) and dependent variables (TempEmp, PartTime) in the former two hypotheses and then later engaged with the moderating variables. For the multiple linear regression, I first included the control variables in the initial window followed by the second step of entering the independent variables in the next window. The findings are reported in the regression table.

For the latter two hypotheses, I used multiple linear regression in the IBM SPSS software to gain a more comprehensive understanding of the entire modeling, including the independent, dependent, and moderating variables while still accounting for the control variables. Job Tenure, the percentage of employed individuals working in a role for less than three years, is utilized as a moderating variable in these latter two models. For the multiple linear regressions, I first included the two control variables (GDP/Capita and TotalEmp) and the dummy variable (Year) in the first window (step1); inserted the two respective standardized independent variables (TempEmp, PartTime) in the second window (step 2); and, lastly, included the interaction term (tempXjob, partXjob) of the two respective standardized independent variables in the third window (step 3). The findings for H3 and H4 are also reported in the regression table in the "Hypothesis Testing" section.

3.7 Analytic Plan

For all four hypotheses, I utilized a multiple linear regression as there were multiple predictor variables including the independent variables, the control variables, and the interaction term between the standardized variables used in each respective moderation. The equation for a multiple linear regression allows for more than one predictor and, in turn, follows this structure: $\mathbf{Y_i = b_0 + b_1 X_i + \ldots + b_n X_n + \varepsilon_i}$. The multiple linear regression equation is structured as ($Outcome_i$)=

$(\text{Model}_i) + (\text{Error}_i)$. In this equation, "Y" is the dependent variable (outcome), "X_i" is the independent variable (predictor), "b_0" is the y-intercept (constant), and "b_1" is the slope of the line (regression coefficient), and "$\boldsymbol{\varepsilon_i}$" is the error term. Ultimately, this is performed utilizing IBM SPSS software that automatically executes the equation modeling and graphs the regression.

4 Empirical Analysis

4.1 Procedures

The data collection process for this study relied upon the gathering of archival data. During the research design process, it was determined that using archival data would prove more effective in yielding statistically significant results than using data collected through an extensive correlational survey process. In turn, I compiled data from twenty-two countries over the period of 2007 to 2016 thus yielding a total *N*-value of 220 for each variable. Utilizing the OECD Statistics (OECD.Stat) database, I was able to compile pertinent datasets into one master dataset that was conducive serviceable for hypothesis testing.

Primarily, I engaged with the "Labour Force Statistics" data offerings provided by the OECD, including "Full-time part-time employment based upon a common definition," "Employment by permanency of the job," and "Employment by job tenure intervals-persons." Each of these datasets provided the necessary data points to create one or more variable(s) within the master dataset. These variables included "Full-time employment," "Part-time employment," "Permanent employment," "Temporary employment," and "Job Tenure," all of which are presented as percentages. In turn, it was necessary to derive the values by dividing the specific numeric values for the four employment variables by the total employment within a given country during a specific year. For "Job Tenure," however, I defined short-term job tenure as being less than three years; therefore, the percentage that is presented represents the measure of job positions in which employees were employed for less than three consecutive years.

4.2 Measures

As this study utilized archival data rather than constructs derived from correlational surveying techniques, the measurement of data reliability does not utilize exploratory factor analysis, but rather pursues a more holistic approach of evaluating the coverage and quality of the secondary data utilized in this study. Additionally, a Cronbach's Alpha (*a*) cannot be reported for these variables, as the data points are not multidimensional due to the archival nature of the data. Throughout this section, the variables utilized will be evaluated for validity and reliability through in-depth analysis that will also serve to ensure that the study may be replicated. Table 1 below delineates the descriptive statistics and correlations between variables.

4.2.1 Dependent Variable

Information Communication Technology (ICT) Patent Output

This dependent variable accounts for the information communication technology patent output of OECD and EU member states by residency of inventor. This data is collected from the OECD.stat database using the "Patents by technology or IPC class" dataset located under the Science, Technologies, and Patents tab. The data included in this set accounts for all patents approved under the triadic patent families (USPTO: United States; JPO: Japan; EPO: Europe). The triadic patent families uphold a high level of intellectual property protection and stand as the world's leaders in patent and trademark best practices (Dernis, 2003). Therefore, this measure maintains validity with regard to its position in the research design and also demonstrates reliability due to the source of the data. ICT patent output provides a form of proxy for digital innovation output in this research study that specifically relates to public sector spending. This figure can be viewed in the master data set as either a raw number or number of patents per 1000 employed persons in country, but for the purposes of hypothesis testing the latter figure was used.

4.2.2 Independent Variables

Full-time Employment (%)

This variable has been derived from the OECD.Stat data on full-time and part-time employment defined as "FTPT employment based on a common definition" that under Labour Force Statistics on the Labour tab of the database. Additionally, this dataset accounts for all persons regardless of sex or age and is collected annually. To create this specific variable, I divided the full-time employment figure by the total employment data also provided by the OECD denoted as the Annual Labor Force statistics. The OECD defines full-time employment as a 30-hour work week requiring regular attendance. This variable demonstrates reliability and validity due to the nature of its source.

Part-time Employment (%)

This variable has been derived from the OECD.Stat data on full-time and part-time employment defined as "FTPT employment based on a common definition" that under Labour Force Statistics

on the Labour tab of the database. Additionally, this dataset accounts for all persons regardless of sex or age and is collected annually. To create this specific variable, I divided the part-time employment figure by the total employment data also provided by the OECD denoted as the Annual Labor Force statistics. The OECD defines part-time employment as working less than 30-hours per work week and requiring regular attendance. This variable demonstrates reliability and validity due to the nature of its source.

Permanent Employment (%)

The permanent employment variable is defined by the OECD as "Incidence of Permanent Employment" and account for all persons regardless of sex or age. The dataset can be located under the Labour Force Statistics tab on the OECD.stat database. This data is collected annually by the OECD and can be further broken down by professional status, sex, or age group. The geographical and time frame coverage of this data further supports its validity when coupled with the reliability of the OECD as a data collection organization. Ultimately, permanent employment gauges an important element of how the work force is structured in any country's given economy.

Temporary Employment (%)

The temporary employment variable is defined by the OECD as "Incidence of Permanent Employment" and accounts for all persons regardless of sex or age. When paired with the permanent employment percentage, this figure accounts for the entire workforce suggesting that all employed persons fall into one of these two categories. The dataset can be located under the Labour Force Statistics tab on the OECD.stat database. This data is collected annually by the OECD and can be further broken down by professional status, sex, or age group. The geographical and time-frame coverage of this data further supports its validity when coupled with the reliability of the OECD as a data collection organization.

Job Tenure (%)

The Job Tenure variable utilized the OECD dataset "Employment by Job Tenure Intervals-Persons". To derive these figures, I summed the employment figures for "< 1 month," "1 to <6

months," "6 to <12 months," and "1 to < 3 years" and then divided this summation by the "total declared" figure; this ratio, in turn, represented the percentage of persons who had a job tenure of less than three years. This figure further demonstrates an additional measure of job permanency that does not rely solely on OECD or national self-reporting with categorical labeling, and thus serves as a safeguard against statistical inaccuracies. The data provided by the OECD maintains a strong level of validity and reliability through both geographical and timeframe coverage. Ultimately, this variable remains a highly reliable measure of job tenure percentage across the OECD countries.

Public Employment (%)

This variable is defined as "employment in general government as a percentage of total employment" under the Government at a Glance-2019 Edition data set, which accounts for all OECD member states as well as providing an average for the both the OECD and non-OECD member states. This data set is included under the Public Sector, Taxation, and Market Regulation tab of OECD.stat with a number of options regarding data interpretation and structure. Utilizing data collected by the OECD, International Monetary Fund (IMF), International Labour Organisation (ILO), and Eurostat, this dataset relies on extensive cross-referencing and built-in reliability controls. In turn, this variable can be recognized as both valid and reliable.

4.2.3 Control Variables

Gross Domestic Product per Capita

Gross domestic product (GDP) is a strong measure of economic strength for any given economy. This data was collected from the OECD.stat database through the dataset "Level of GDP per Capita and Productivity" that is listed under the Productivity tab. With extensive coverage of real GDP per capita statistics on its member states, the OECD maintains a high level of reliability and validity with the data that it collects and publishes. This measure is used as a control to ensure that economic strength is accounted for when engaging in hypothesis testing.

Total Country Employment

The total country employment variable has been collected from the OECD.stat database under the Annual Labour Force Statistics tab. The dataset "Employment" provides longitudinal, archival data about the size of country employment for OECD member states. This figure maintains validity and reliability due to its source and purpose of measure. Ultimately, total country employment is utilized as a control variable to ensure that total population size does not interfere with the research design of the study and cause the findings to be skewed.

Year

The Year variable is utilized as a dummy variable to account for any macroeconomic trends that exist due to worldwide fluctuations in annual economic output. In turn, this is included in each model to ensure that the specific year for each data point is accounted for and does not skew the data output.

Table 2: Descriptive Statistics and Correlations

Variable	Mean	SD	1. TotalEmp	2. PermEmp	3. TempEmp	4. FullTime	5. PartTime	6. JobTenure	7. GDP/Capita	8. PubEmp
1. TotalEmp	7,951	9,927								
2. PermEmp	61.20%	19.20%	-.507**							
3. TempEmp	38.70%	19.20%	.507**	-1.000**						
4. FullTime	84.50%	8.60%	-.185**	.226**	-.226**					
5. PartTime	13.20%	7.70%	.288**	-.299**	.299**	-.890**				
6. JobTenure	26.00%	6.40%	-.119	.238**	-.238**	-.015	.079			
7. GDP/Capita	37,118.20	15,744.00	-.022	-.162*	.162*	-.551**	.490**	-.040		
8. PubEmp	18.70%	5.00%	-.373**	.349**	-.349**	.323**	-.273**	.472**	-.240**	
9. ICTPatents	110.1	211.7	.77**	-.350**	.350**	-.343**	.474**	.039	.151*	-.139*

N=220. Correlation is significant at the 0.01 level (**) or 0.05 level (*). TotalEmp (in Millions of persons).

To better grasp the correlations as they specifically relate to each hypothesis, I have included scatterplots of the correlations between the two dependent variables (no moderating), Temporary Employment and Part-time Employment, and the independent variable, ICT Patent Output/1000.

These plots do not denote the moderating variable included in H3 or H4; ~~however,~~ they do, however, provide a basic understanding of how the data from the dependent variables interacts with that of the independent.

The data represented above in Table 2 demonstrates the correlation between Temporary Employment and ICT Patent Output (adjusted per thousand total employees). Each datapoint represents one of the twenty-two countries combined with a specific year between 2007 and 2016 that are included in this study. H1 and H3 both rely upon this independent variable, Temporary Employment, and dependent variable, ICT Patent Output. As is evident, Figure 2 demonstrates that there exists a small, positive correlation between the temporary employment percentage and information communication technology patent output per 1,000 employed persons.

Table 2, above, demonstrates the relational data between the Part-Time Employment independent variable and ICT Patent Output per 1,000 employed persons dependent variable. This data is pertinent to H2 and H4, which utilize the correlation between the two variables in deriving the regression analysis.

4.3 Sample

The sample utilized in the data collection process is composed of twenty-two countries that are both members of the European Union (EU) and the Organisation for Economic Cooperation and Development (OECD). The sample itself ensures that the countries sampled have fairly common economic systems as is ensured by the inclusion guidelines delineated by both the OECD and the EU. In turn, the sample countries can be adequately compared to one another and used in conjunction for the construction of a master dataset. For each of the twenty-two countries that were sampled, longitudinal, archival data has been collected ranging from 2007-2016. In the table below, I have denoted the countries that were used as well as the abbreviations for each of the given countries according to EU and OECD data.

Table 3: Countries Sampled

AT-Austria	IT-Italy
BE-Belgium	LV-Latvia
CZ-Czechia	LT-Lithuania
DK-Denmark	LU-Luxembourg
EE-Estonia	NL-Netherlands
FI-Finland	PO-Poland
FR-France	PT-Portugal
DE-Germany	SK-Slovakia
GR-Greece	SI-Slovenia
HU-Hungary	ES-Spain
IR-Ireland	SE-Sweden

4.4 Findings and Reporting

The methodological theory behind this study design is to demonstrate effectively the correlative relationship between the independent, dependent, and moderating variables while accounting for the control variables in the process. In turn, the thesis will initially report the descriptive statistics for each variable to demonstrate the mean, standard deviation, and other variable specific information so that the reader may fully grasp the basic characteristics of the dataset. Additionally, a more in-depth correlation table will be presented that demonstrates the relationship between all of the variables in the research study. Correlations must be addressed prior to engaging in any regression analysis because this is how the relationship between two variables is quantified.

Following this step, multiple linear regressions will be run to engage in hypothesis testing and further analyze the specific relationships between dependent and independent variables while accounting for control and moderating variables. Regression, juxtaposed with correlation, does not simply address the relationship between two variables, but also provides the ability to understand how an increase in one unit of the predictor impacts the overall outcome. This provides the researcher the ability not only to explain the relationship between the independent and dependent variable, but also to predict values in the generalized population. In turn, regression enables the researcher both to predict and explain outcomes.

After providing the results of the regression analyses, graphical representations of the relationships will be provided to demonstrate a more thorough understanding of the hypothesis testing outcomes. The regression equations will be plotted to compose these graphics. Additionally, limitations relating to the research study theory and data will be addressed followed by an in-depth discussion for further expansion on the ramifications of the findings as they relate to the research topic. Lastly, the findings will be used to make recommendations for strategic human capital procurement in the Finnish business space as a means of bettering the operational effectiveness of the Finnish Digital Agency.

5 Findings

5.1 Hypothesis Testing

In this section, I denote the specific statistical results for the regression analyses run on the IBM SPSS software for each individual hypothesis. Each set of data is graphed with the regression equation superimposed on the image. The regression line provides a better understanding of how the independent variables (H1 and H2) and the independent variable interaction term (H3 and H4) impact the dependent variable.

Hypothesis One

For the first hypothesis (H1), I find that that there is no evidence to support this hypothesis with b= -.087, 95% CI (-2.028, .105), p>.05. Not only is the statistical evidence not significant with a p=.077, but the evidence suggests that there is a negative relationship between temporary employment and information communication technology output. Figure 2 below shows the regression equation and associated data for the H1.

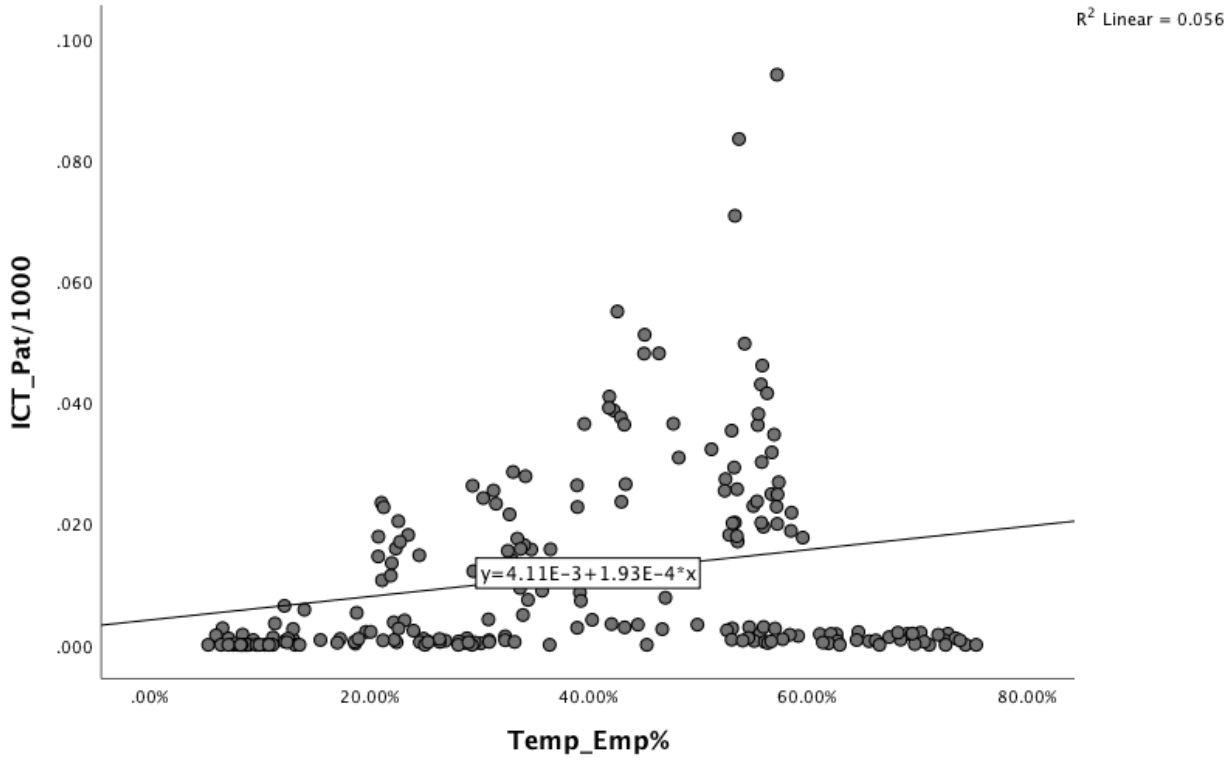

Figure 2: Temporary Employment Regression

Hypothesis Two

For the second hypothesis (H2), I find that there is evidence to support this hypothesis with b=.248, 95% CI (4.240, 9.463), p<.01. In turn, this demonstrates that there is a significant, positive relationship between part-time workforce and information communication technology patent output, thus demonstrating that part-time labor positively influences digital innovation output. Figure 3 below shows the regression equation and associated data for the H2.

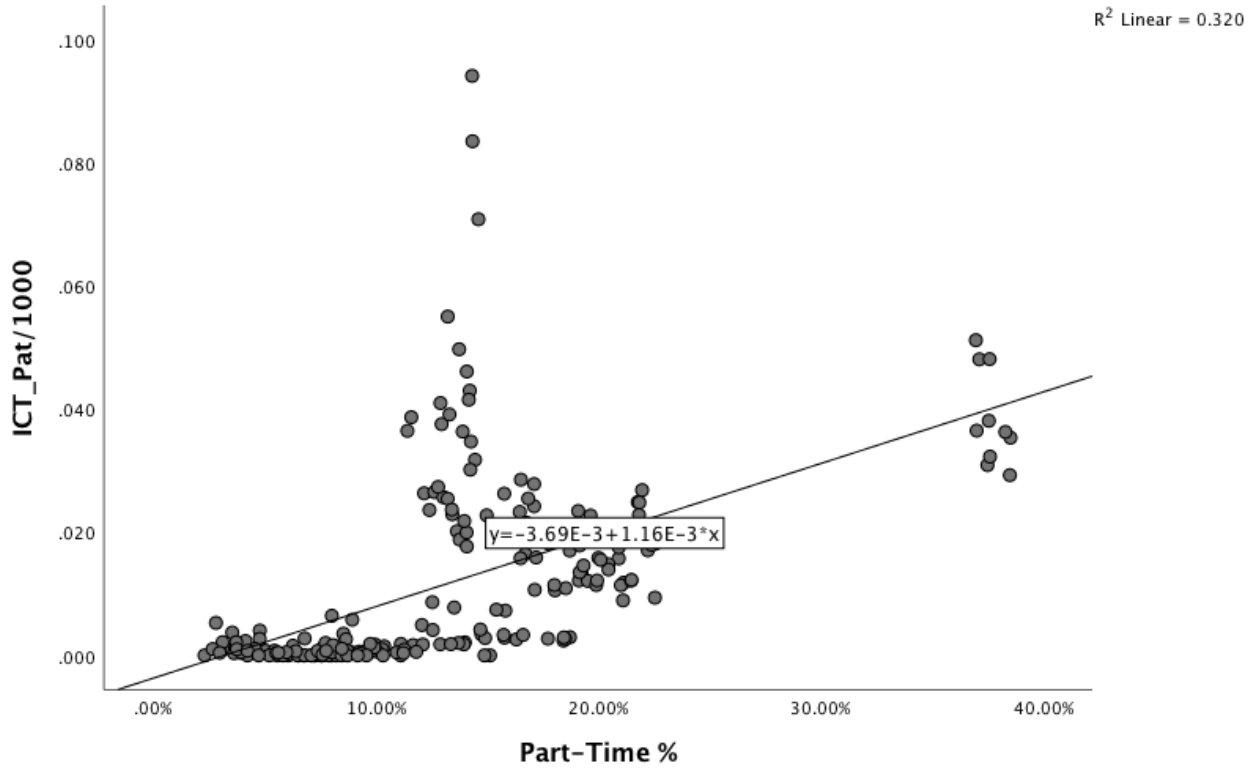

Figure 3: Part-Time Employment Regression

Hypothesis Three

For the third hypothesis (H3), I find that there is evidence to support this hypothesis with b=.225, 95% CI (-1.045, 4.540), p>.05; however, it is not statistically significant with a p=.219. In turn, there is not statistical evidence that Job Tenure positively moderates the impact of Temporary Employment on ICT Patent Output. Figure 4 below shows the regression equation and associated data for the H3.

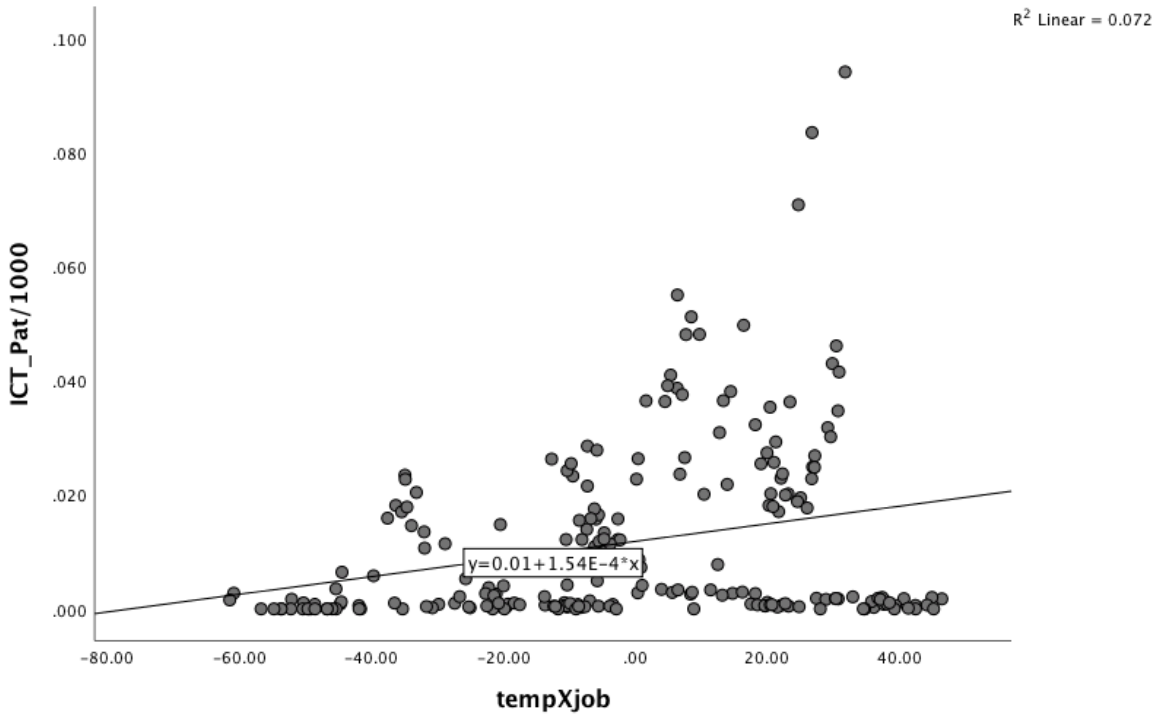

Figure 4: Temporary/Job Tenure Regression

Hypothesis Four

For the fourth hypothesis (H4), I find that, once again, there is evidence to support this hypothesis with b=.217, 95% CI (-.224, .638), p>.05; however, it is not statistically significant with a p=.344. In turn, there is no statistical evidence that Job Tenure positively moderates the impact of Part-time Employment on ICT Patent Output. Figure 5 below shows the regression equation and associated data for the H4.

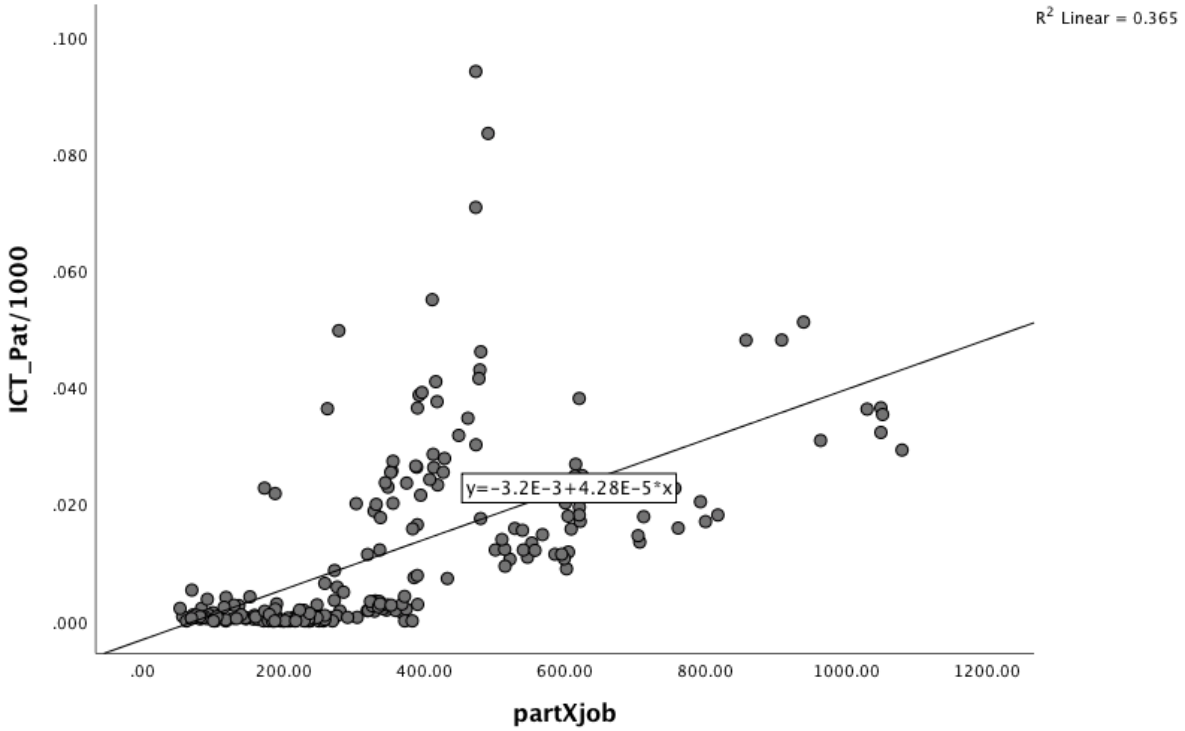

Figure 5: Part-Time/Job Tenure Regression

5.2 Summary of Results

Ultimately, the multiple linear regression analysis yielded support for hypotheses two, three, and four (H2, H3, H4); however, only the second hypothesis proved to be statistically significant. In turn, it can be determined that the macroeconomic trend to procure part-time employees facilitates an increase in information communication technology patent output.

In Table 3 below, statistics relating to the regression modeling of H1 and H2 can be found. Results for each model of the regression analysis are presented including both coefficients and model summary data. As previously noted, I did not find adequate support for H1 while I did for H2. The associated standardized beta values for each hypothesis are highlighted on the regression results table (Table 4) with their respective significance values.

Table 4: Regression Results for ICT Patent Output (H1 and H2)

	Model 1			Model 2		
	β	SE	Beta	β	SE	Beta
H1						
Coefficients						
Constant	-37.204	39.428		-20.482	40.346	
TotalEmp	0.017**	0.001	.774**	0.017**	0.001	0.818**
Year	-6.676*	3.113	-0.91*	-6.135	3.113	-0.083
GDP/Capita	.003**	0.001	.186*	0.003**	0.001	0.2**
TempEmp				-0.962	0.541	-0.087
Model Summary						
R-Squared		0.628			0.634	
Adjusted R-Squared		0.623			0.627	
F-Statistic		121.779			93.036**	
H2						
Coefficients						
Constant	-37.204	39.428		-61.277	37.560	
TotalEmp	0.017**	0.001	.774**	0.015**	0.001	0.7**
Year	-6.676*	3.113	-0.91*	-5.909*	2.947	-0.08*
GDP/Capita	.003**	0.001	.186*	0.001	0.001	0.061
PartTime				6.851**	1.325	0.248**
Model Summary						
R-Squared		0.628			0.670	
Adjusted R-Squared		0.623			0.663	
F-Statistic		121.779**			108.901**	
N=220. *p<.05. **p<.01.						

With regard to hypotheses three and four, as noted earlier, the lack of statistical significance featured in either regression model makes for insufficient evidence to support either hypothesis. Although the standardized beta values of H3 (b=.225) and H4 (b=.217) suggest that there is indeed a relationship between the interaction terms and the dependent variable, there are other statistics that raise questions as to the accuracy of the model. One such example is the F-Statistic, or measure of variance between Model 2 and Model 3. This measure should be higher in the Model 3 Model 2 if it were to report the expected amount of variance when the interaction term is included, but, in fact, the F-Statistics actually decrease in H3 from Model 2 (77.311) to Model 3 (64.836). When combined with the lack of statistical significance in H3 and H4 (p>.05), it

becomes evident that no moderation takes place in either of these models. Further statistics related to the regression modeling for H3 and H4 can be found in Table 5 below.

Table 5: Regression Results for ICT Patent Output (H3 and H4)

	Model 1			Model 2			Model 3		
	β	SE	Beta	β	SE	Beta	β	SE	Beta
H3									
Coefficients									
Constant	-37.204	39.428		-93.298*	43.004		-94.588*	42.964	
TotalEmp	.017**	0.001	.820**	.017**	0.001	0.82**	.017**	0.001	.817**
GDP/Capita	0.003**	0.001	0.186**	0.003**	0.001	0.192**	.002**	0.001	.185**
Year	-6.676*	3.113	-0.091*	-2.721	3.383	-0.037	-2.007	3.428	-0.027
TempEmp				-13.894	10.45	-0.066	-59.17	38.167	-0.279
Job Tenure				23.772*	9.778	0.112*	26.744**	10.059	0.126
tempXjob							1.747	1.417	0.225
Model Summary									
R-Squared		0.628			0.644			0.646	
Adjusted R-Squared		0.623			0.635			0.636	
F-Statistic		121.779**			77.311**			64.836**	
H4									
Coefficients									
Constant	-37.204	39.428		-7.687	43.031		-76.658	84.495	
TotalEmp	.017**	0.001	.820**	.015**	0.001	0.715**	0.015**	0.001	0.718**
GDP/Capita	0.003**	0.001	0.186**	0.001	0.001	0.065	0.001	0.001	0.063
Year	-6.676*	3.113	-0.091*	-3.125	3.227	-0.042	-3.314	3.234	-0.045
PartTime				49.155**	10.206	.232**	8.693	43.86	0.041
Job Tenure				18.975*	9.292	.090*	1.616	20.525	0.008
partXjob							0.207	0.219	0.217
Model Summary									
R-Squared		0.628			0.676			0.677	
Adjusted R-Squared		0.623			0.668			0.668	
F-Statistic		121.779**			89.240**			74.481**	
N=220. *p<.05. **p<.01.									

6 Limitations

This research study utilizes archival, longitudinal data relating to macroeconomic indicators as a means of deriving the relationships between human capital procurement practices and digital innovation outputs. Sound theoretical justification is provided in the literature review section of this paper; however, there are limitations associated with the theoretical justification as well as the quantitative design. In this section, I will identify some of the limitations that have been identified as a means of encouraging future research to replicate and improve the findings that I have presented in this paper.

6.1 Theoretical Limitations

As is denoted in the literature review, the aim of this study is to determine the best human capital sourcing procurement practices for the Finnish Digital Agency. The literature surrounding employee sourcing specifically addresses insourcing, outsourcing, and in-house outsourcing; however, it is immensely difficult to find archival data relating to both public and private sector contract structuring. Therefore, this study relied upon macroeconomic statistics relating to the overall economies of twenty-two countries. Assessing the proxy variable of information communication technology output offers some insight into how macroeconomic employment practices impact digital innovation output trends. As such, this research design surveys important trends at the level of a country's economy; however, it does not look at how procurement impacts the individual firm. In turn, the takeaways and recommendations from this study must be understood as more general observations about economic policy decision-making rather than clear imperatives for establishing firm-level strategic management policies.

Another important limitation of the findings that must be acknowledged is that all countries are not the same. Of course, this remains true regarding almost every aspect of comparing one country to another, but nevertheless the general trends registered from across twenty-two countries can provide some measure of useful insight. Specifically, the differences that I aim to address are related to economic size and composition, macroeconomic policy, and resource accessibility. Germany, for example, has a total workforce of over 41 million people with a per capita GDP of $50,564 as of 2016; meanwhile, Latvia has a workforce of only 893,000 people

with a per capita GDP of $26,407 as of 2016 (OECD. Stat, 2020). It is evident that comparing the workforce composition of two such extraordinarily different economies presents a number of limitations both theoretically and quantitatively. Furthermore, Germany and Latvia have varying histories, natural resources, and socio-cultural norms that make a direct comparison even more complex.

In addition to the explicit differences in economic structure of many of these countries, social safety nets must also be recognized as yet another limitation of this research. The amount of public expenditure on education, unemployment support, and numerous other social welfare programs are difficult to account for in a quantitative study relying on archival data. The amount of part-time and temporary laborers in any given country depends not only on the health of the economy but also the ability of people to transition from one job to another. The "gig economy," defined as executing tasks through "crowdwork" or "work-on-demand via app," relies on a transitional, dynamic labor force (De Stefano, 2015). In turn, economies with a large "gig economy" sub element must have the ability both to provide strong intermittent wages and to offer support to those with temporary unemployment via social safety nets. Countries in Western Europe and the Nordics tend to have much stronger government assistance programs in place, thus permitting higher levels of temporary and part-time employment than do those of eastern and southern Europe. Ultimately, the relationship of the existence of social safety nets to the increase or decrease in digital innovation outputs must be addressed in future research initiatives.

As previously addressed, the constraints placed on this study by the limited nature and availability of data requisite for suitable analysis have required a theoretical justification for constructs and proxy variables that could potentially impose theoretical limitations on the research study. Utilizing variables such as "temporary employment" or "part-time employment" accounts for hundreds of thousands and even millions of employees with varying types of contractual agreements with a singular, or numerous, employer(s). As such, the ability to demonstrate the reliability of this study is limited due to the constructs and variables that are in place. In the absence of constructs derived from specific firms in a specific economy, it is difficult to ensure that the theoretical design of this study accurately supports the intentions of its research questions and hypotheses.

6.2 Data Limitations

Although there are some limitations related to the design of this research project, the major limitations of this study can be attributed to the sources for and the types of data marshaled herein for analysis. In this study, macroeconomic data was mined to create archival datasets consisting of pertinent information intended to function as independent, dependent, and control variables. This, per se, is not a limitation by any means. In fact, utilizing archival data rather than correlational survey decreases the risk of self-reporting bias skewing the information that is collected. The limitation, however, lies in the fact that this data evaluates sourcing and procurement trends of employment on a country level rather than at the firm level. As such, the data answers the question of how employment trends impact digital innovation in the national economy rather than how strategic management practices of a specific firm facilitate or hinder digital innovation output.

Another limitation related to the type of data retained for this project involves the specific control variables of the study. The two control variables, excluding the dummy control variable "Year", are "Total Country Employment" and "GDP per Capita". In terms of theory, these two variables control for the overarching size of a given economy and ensure that countries like Germany and Latvia will be evaluated under similar conditions. Both of these controls, however, are plagued by potentially distorting limitations. First of all, "Total Country Employment" represents the overall number of persons that have attained working age in the country—a statistic that is standardized by the OECD—but it does not account for specific labor constraints, socioeconomic expectations for employment, or undocumented workers. Additionally, there is the question of how this figure impacts the regression models for each of these variables, a question that will be considered further in the "Discussion" section of the study. The second control variable, "GDP per Capita," addresses the strength of the economy while continuing to take the size of the workforce into account. In theory, this control variable is not redundant as it evaluates an alternative measure; however, there could be some issues with the regression model utilizing both of these controls. Ultimately, this variable—in how it factors into the equation of the overall health and vitality of an economic system—could potentially serve as a more complete control to use in future studies.

In addition to these variable issues, this study also suffers some constraint due to restrictions related to data reporting. Although self-reporting bias was avoided by collecting archival data rather than survey data, there is still the question of how each individual country reported figures to the OECD. The issue is not any lack of transparency on the side of the OECD, as is addressed in the "Measures" section of the "Empirical Analysis," but rather the country level data collection, classification mechanisms, and reporting practices. This limitation could be mitigated in future studies by coupling an empirical study utilizing correlational survey data with the current study. A study of this design could serve to establish a multidimensional understanding of the data presented. This being said, the OECD statistics unit has built in protocols to verify and cross-reference the data that it collects and then analyzes. Ultimately, this limitation is something that exists when executing quantitative research at the macroeconomic level and, in turn, is quite difficult to mitigate.

7 Discussion

In the limitations section, I discussed the control variables that were plagued by the potential for redundancy within the data to negatively impact the validity of the regression findings. In this section, I investigate alternative models that could possibly provide stronger results throughout the regression analysis process.

7.1 Alternative Control Variables in Linear Regression

Hypotheses One and Two

For hypothesis one, as reported earlier in this study, we found that the standardized beta value (*b)* was not significant when controlling for both GDP per capita and total country employment; however, it was discussed in the limitations section that the redundancy between total country employment and GDP per capita could, in fact, prove problematic. As GDP per capita is a stronger measure of overall economic size and power, I ran the regression model again without using total country employment as a control variable. The findings were quite interesting. Rather than having b= -.087, 95% CI (-2.028, .105), p>.05 as the results and thus suggesting that there is, in fact, a negative relationship between temporary employment and ICT patent output with no statistical significance, I found b= .204, 95% CI (.000, .000), p<.01. This suggests that there does, in fact, exist a positive relationship between temporary employment and ICT patent output and statistical significance. Additionally, the t-statistic—which permits the rejection of the null hypothesis if above the minimum threshold for the confidence interval—registered 3.201 and is thus higher than the threshold of 2.576. Ergo, we can reject the null hypothesis when discarding total country employment as a control variable.

There remains, however, an issue with the confidence intervals including zero, which suggests that the null hypothesis remains in effect. The model fit statistics, including the ANOVA F-statistic and the R^2 value are both promising and not. The F-statistic decreases with the addition of the predictor value in model two, but only slightly. The R^2 value, however, is statistically significant and suggests that there is indeed statistical variance in the independent variable caused by the dependent. In turn, the data suggests that there is a positive relationship between temporary employment and ICT patent output, but we cannot have confidence in this due to the

lack of statistical significance and data presented in the model fit statistics. Ultimately, further research would need to be conducted to determine the exact relationship between temporary employment and ICT patent output, but there is almost certainly an interesting relationship that exists.

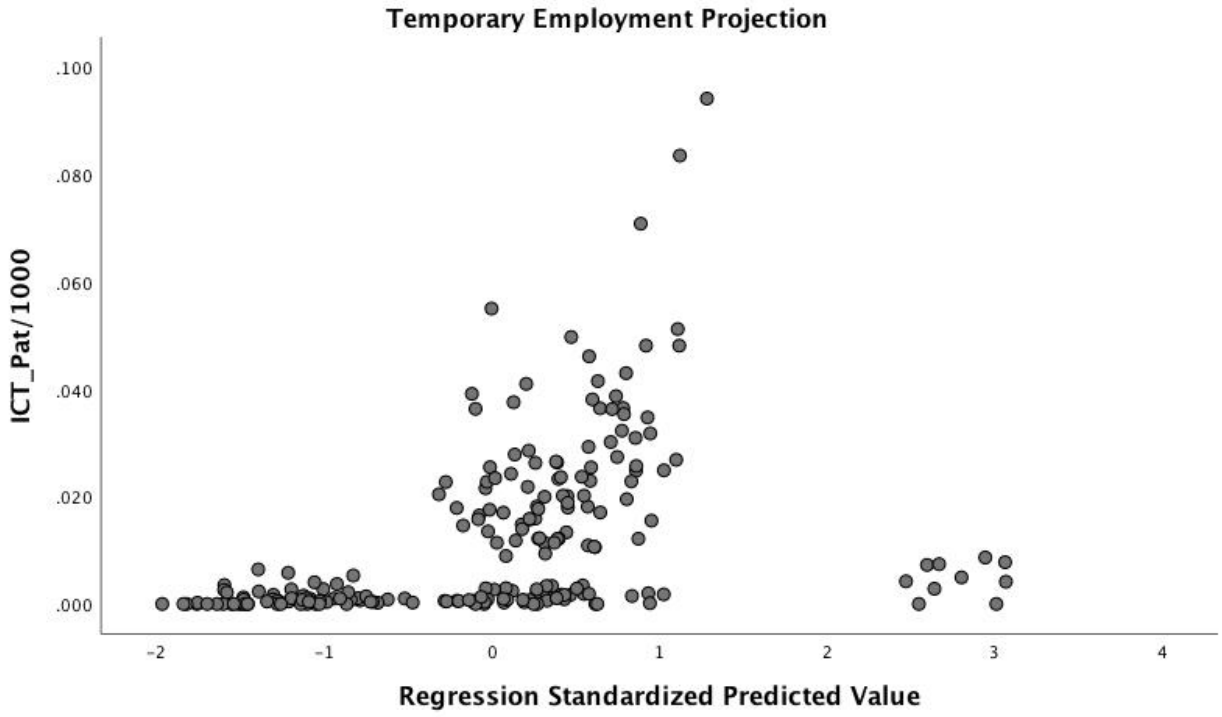

Figure 6: Temporary Employment Predicted Value

In Figure 6 above, the regression relationship is presented in the form of standardized predicted value (ZPRED). Regression accounts for the correlation between two variables, but the model also permits the researcher to examine how an increase or decrease in the predictor variable impacts the independent. Here, it is evident that an increase in temporary employment percentage has a positive impact on the ICT patent output per 1,000 employees. On the contrary, a decrease tends to limit the amount of ICT patent output. Thus, this figure reports in graphic form support for the validity of the first hypothesis.

For the second hypothesis, I conducted a similar investigation to ascertain further how the model performed without total country employment as a control variable. The findings were similar to the initial regression analysis in that there remains support for H2 with b= .540, 95% CI (.001, .001), p<.01. In fact, the standardized beta coefficient (b) increased from b=.248, thereby

demonstrating an even stronger correlation between part-time employment and ICT patent output. The t-statistic for H2 is extremely high with a value of 8.461, which is far above the minimum threshold of 2.576 for the 99% confidence interval. We continue to see strong model fit statistics with the ANOVA F statistic increase as well as the R^2 value. These findings are promising as we continue to see that the model supports H2 and that I may reject the null hypothesis. Once again, further research could yield a more comprehensive understanding of the relationship between these variables, but for now this study has determined that part-time employment does indeed positively impact our proxy for digital innovation output.

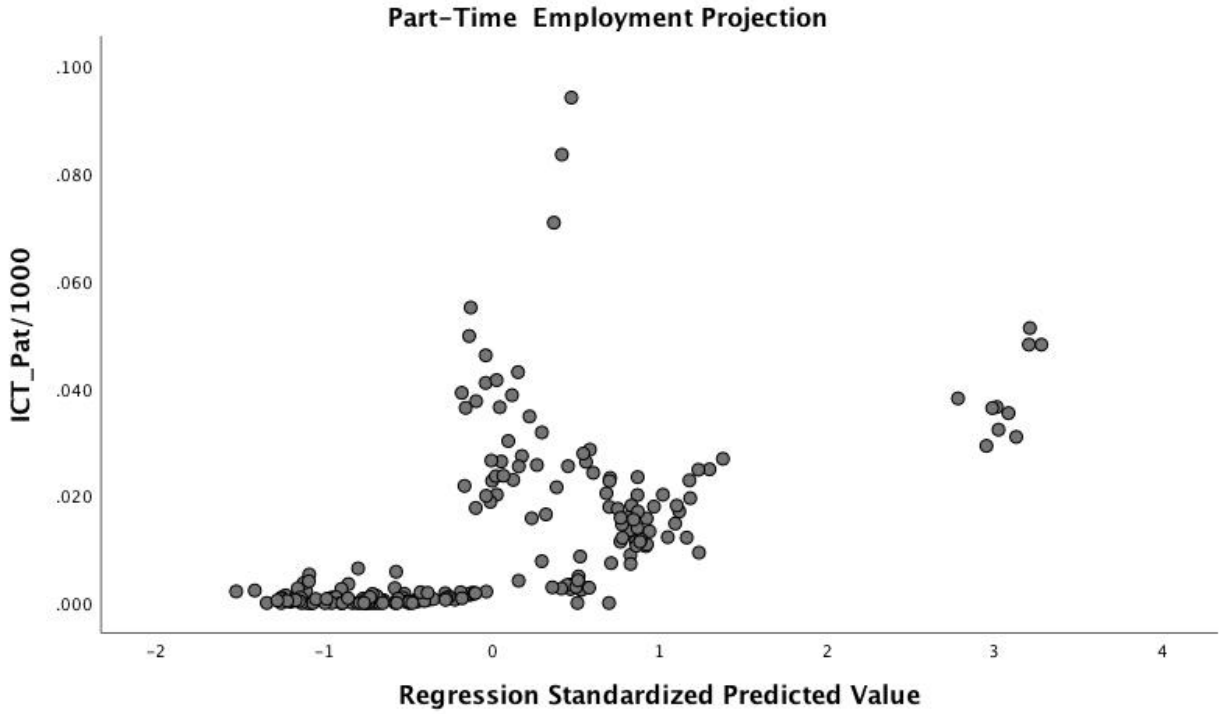

Figure 7: Part-Time Employment Predicted Value

In Figure 7 above, the regression predicted value is presented with the part-time employment predictor and the impact that it has on ICT patent output per 1,000 employees. Again, we see that an increase in part-time employment percentage yields an increase in patent output and vice-versa when accounting for a negative change in the predictor value.

The underlying message one can derive from the research surrounding the first two hypotheses is that alternative forms of contractual employment yield greater outputs for innovation. This, of course, needs to be further explored; however, it is evident that temporary employment and part-

time contracts have a relationship, seemingly positive, on ICT patent output. As it relates to the theoretical framework, this is to be expected. The literature suggests that long-term employment can lead to stagnation in innovative thinking, process design, and employee interest in project work. The data associated with these statistics, in certain cases, is self-reported by country, which can raise issues related to the probable lack of uniformity in the data. As such, this research study utilized job tenure, or the percentage of employment that lasted less than three years, as a moderating variable in the latter two hypotheses to further examine the relationship between the predictors, temporary employment and part-time employment, and the independent variable, ICT patent output per 1,000 employees.

Hypotheses Three and Four

As previously indicated, the standardized beta (*b*) values for both H3 and H4 were not statistically significant when accounting for all of the control variables and thus did not provide support for these two hypotheses. To press the regression model further, therefore, I reran the SPSS regressions without total country employment being included in the control variables. The findings were significantly more promising.

In hypothesis three, the results went from being b=.225, 95% CI (-1.045, 4.540), p>.05 to b=.931, 95% CI (.000, .001), p<.001. The standardized beta statistic notably increased along with the statistical significance. Additionally, as noted earlier, if the t-statistic registers above the threshold of 2.576, we may with 99% confidence level reject the null hypothesis. The t-statistic in this run tallied 3.601. It must be noted, however, that the confidence interval still presents an issue as zero is included in this interval thus meaning that the null hypothesis still remains a possibility. The ANOVA F-statistic did not increase with the addition of the interaction term although it was statistically significant as was the R^2 value in the model summary. These findings suggest that there is a positive relationship between the interaction term, temporary employment and job tenure (percentage of employment lasting less than three years), and the dependent variable, ICT patent output per 1,000 employees. Although this is promising and allows the rejection of the null hypothesis, further examination would be beneficial to understand exactly what is impacting the model and why the bounds for the confidence interval continue to include zero.

It seems once again that including total country employment in the control window compromised the validity of the findings in this regression, in much the same way it did in the cases of the first two hypotheses. Discarding this control improved the model's support of the hypothesis, although there remain several statistical limitations in the findings. In the final analysis, there appears sufficient reason to reject the null hypothesis and thereby infer that the statistical evidence supports H3.

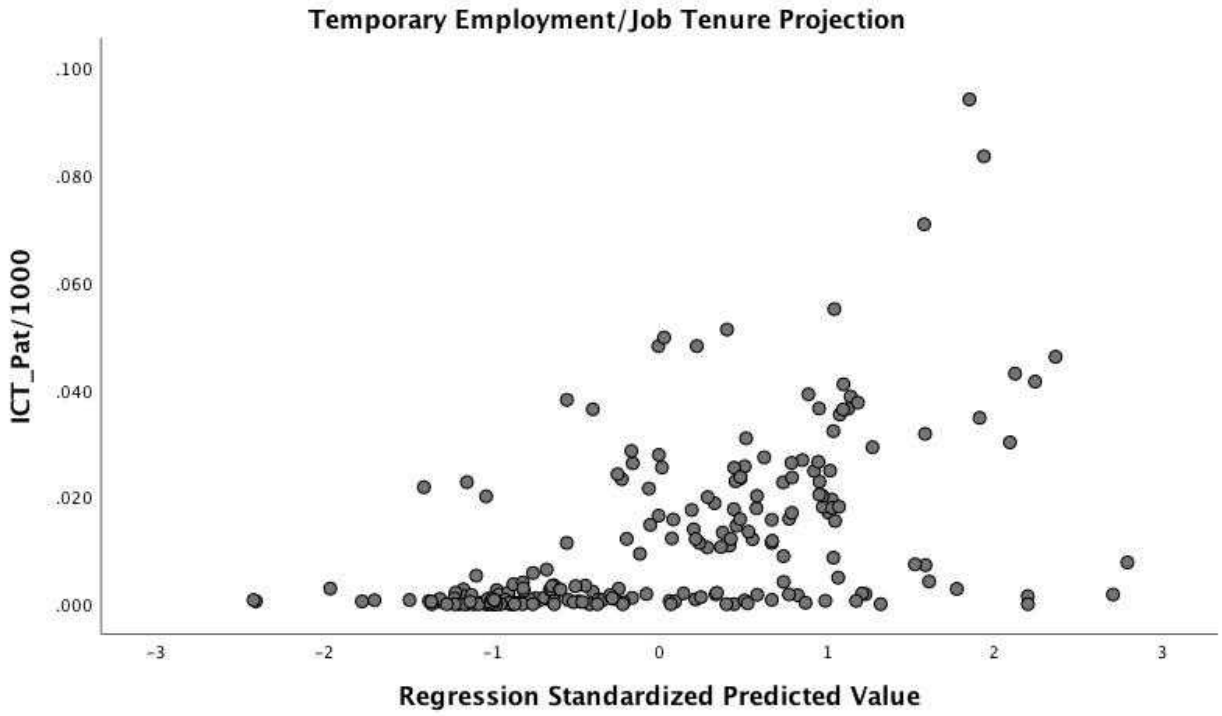

Figure 8: Temporary/Job Tenure Predicted Value

The projections plotted in Figure 8 above clearly demonstrate that the interaction term between temporary employment and job tenure has a positive relationship with ICT patent output. With an increase in the interaction term, ICT patent output increases, as can be seen on the right side of the scatterplot, while the opposite occurs when the interaction term decreases. Thus, the data shown in this graph provide yet more support for the third hypothesis.

The findings of this regression fit well into the theoretical framework of the study as the temporary employment and job tenure variables complement one another and strengthen the

validity of the constructs. Temporary employment is not always easy to discern, especially in the context of an entire country's economy, so the combination of this variable with job tenure (defined as all employment lasting less than three years) establishes a common definition across country reporting. In sum, hypothesis three has both theoretical and statistical support.

The fourth hypothesis yielded poor results in the initial findings of the regression analysis with b=.217, 95% CI (-.224, .638), p>.05. When this hypothesis was retested with total country employment removed as a control variable, the support for the hypothesis actually decreased with b=.153, 95% CI (.000, .000), p>.05. Not only did the standardized beta value decrease, but the confidence interval bounds narrowed to zero alone; thus, in this instance, the null hypothesis cannot be rejected. Additionally, the ANOVA F-statistic decreased with the addition of the interaction term and the R^2 value was not found to be statistically significant.

Observing in H4 that the significance level increased to p=.630 and the t-statistic tallied at .482, we recognize that the minimum threshold of 1.645 required to reject the null hypothesis was not attained. Hence, the null hypothesis could not be rejected for hypothesis 4, from which we deduce that the interaction of part-time employment and job tenure does not yield a positive effect on the independent variable, ICT patent output.

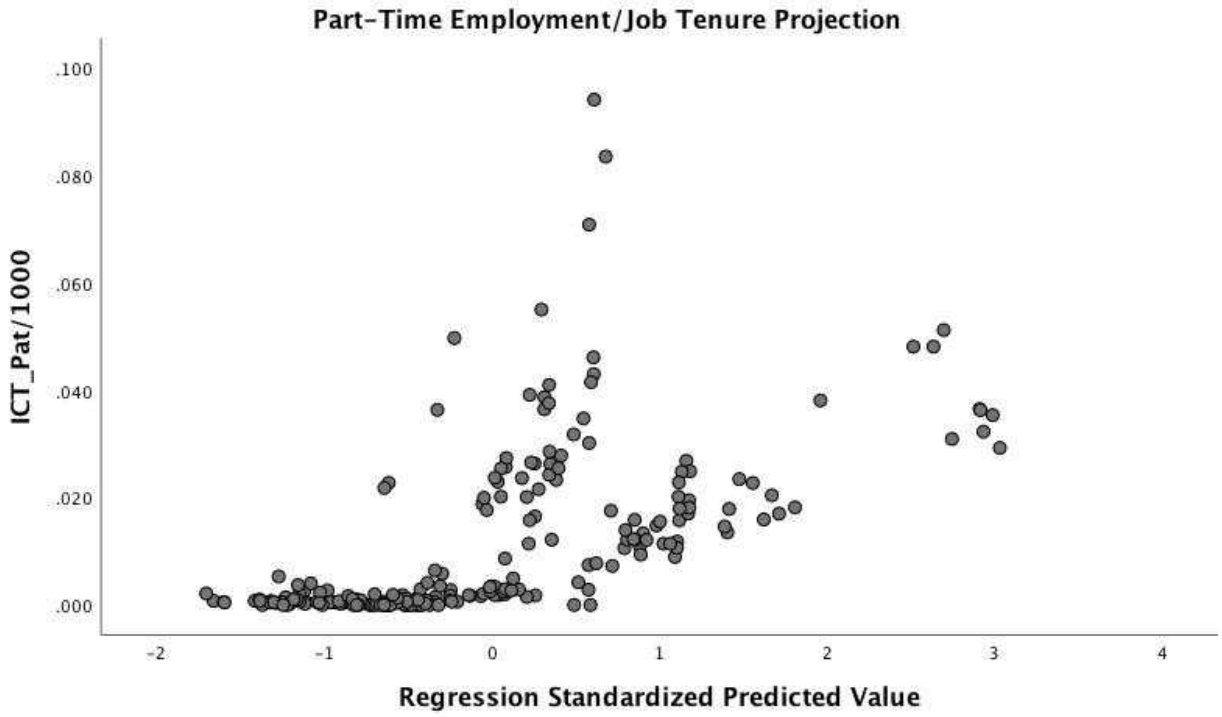

Figure 9: Part-Time/Job Tenure Predicted Value

In figure 9 above, the scatterplot provides a visual representation of the impact that the interaction term, part-time employment and job tenure, has on the independent variable, ICT patent output per 1,000 employees. Although there seems to be a positive relationship between increases in the interaction term and the dependent variable, the data points do not have a strong correlation in this regression model. Additionally, the model summary discussed above demonstrates a lack of support for the hypothesis even though there is a positive standardized beta value (*b*), a sign that usually indicates a positive relationship between the predictor and independent variables.

For these reasons, then, the fourth hypothesis cannot be supported, and the null hypothesis cannot be rejected. This is particularly interesting considering that the second hypothesis had strong support and utilized part-time employment as the independent variable. This suggests that the combination of short-term job tenure and part-time employment actually decreases the innovation outputs of an economy, which—although not expected in the context of the theoretical framework—is comprehensible. Part-time employment tends to denote a functioning "gig-economy," a feature that would tend to facilitate innovation; however, when part-time

employment is combined with short-term contractual employment, it is quite possible that employees do not develop the necessary commitment to the firm that is necessary to engage in strong innovation efforts. Furthermore, the group of employees that comprise this specific group may not operate as independent contractors or consultants but rather execute labor roles that require very basic skillsets. In turn, the findings of this fourth hypothesis contribute significantly to the research study and the possible implications for human capital procurement strategy and overall employment.

7.2 Implications for Outsourcing Research and Practice

Let us return to the question of how human capital procurement strategy impacts digital innovation. We have in the course of this research project scrutinized the impact of temporary and part-time employment on innovation output through both theoretical and empirical quantitative analysis. We began by reviewing the theory behind firm-level employee procurement and then utilized regression analysis to evaluate macro-economic trends among OECD and EU member states with regard to temporary employment, part-time employment, job tenure, and information communication technology patent output. The relationship between human capital procurement and digital innovation output is one that is so deeply entangled with numerous other elements that impact individual firms that we retained country-level data in an effort to ensure that individual firm structure, policy, or strategy would not adversely impact the quantitative findings.

The theoretical framework of this study engages with the relationship that employment contracts have, in terms of length and commitment to the firm, on digital innovation outputs. The three major procurement strategies that are addressed in the literature review and theoretical background are outsourcing, insourcing, and in-house outsourcing. Traditional outsourcing involves utilizing a third-party company to execute tasks, whether they be manufacturing or service provision, from their location and with their employees. This structure typically aims to reduce the input costs associated with production or service provision but can have a negative impact on the quality of output as there is no direct oversight from the firm that has hired the third-party. Insourcing, as it is defined in this study, involves the direct hiring of employees to complete tasks for the firm. This often requires lengthy contracts and can be quite expensive,

especially in countries with strong labor protect legislation. If a firm aims to remain lean in its business operations, direct hiring practices tend to hinder this goal. In-house outsourcing, also known as "under-the-same-roof outsourcing," utilizes short-term contracts with third-parties to bring in their employees to execute tasks; this form of procurement allows the firm to maintain direct oversight and provide feedback loops that assist in improving quality standards and innovation (Bonazzi and Antonelli, 2003). In turn, in-house outsourcing procurement strategy seems to offer the greatest level of efficiency with regard to cost and output quality, which is necessary for increased digital innovation.

In addition to these general categories of human capital procurement, theories on knowledge management, corporate boundaries, and "gig-economy" are addressed to better understand the nuance of contractual employment. Some researchers suggest that directly employing human capital increases the knowledge and innovation outputs of the firm, while others proclaim that human capital can become stagnant and repetitive under direct, long-term contracts. Supporters of the "gig economy" argue that employees with more job flexibility and mobility are more innovative and productive, while detractors of this sourcing model contend that temporary employment decreases innovation output due to a lack of commitment to the firm. Mindful of both sides of this debate and grounded upon a framework derived from a thoroughgoing literature review, this study leads us to conclude that non-traditional contractual employment, such as temporary or part-time, facilitates greater innovation within industries that are heavily digitalized.

This work further explores the relationship between employment structure and innovation through a quantitative, empirical analysis. In the theoretical framework, four hypotheses were crafted: temporary employment has a positive effect on ICT patent output (H1); part-time employment has a positive effect on ICT patent output (H2); the effect of temporary employment on ICT patent output is positively moderated by job tenure (H3); and the effect of part-time employment on ICT patent output is positively moderated by job tenure (H4). Each of these hypotheses follows the theoretical belief that alternative forms of employment facilitate strong digital innovation outputs. To test these hypotheses, linear regression modeling was executed and

evaluated to determine the impact of the respective independent variables on the dependent variable.

Initially, data collected from the OECD statistics database was compiled and, from this, a number of variables were derived to be used in the quantitative study. The independent variables utilized in the study are temporary employment (as a percentage of total employment), part-time employment (as a percentage of total employment), and job tenure (total employees with roles lasting less than 3 years as a percentage of total employment). The dependent variable, information communication technology patent output (per 1,000 employees), remained constant across all hypotheses. In the study, controls were established for gross domestic product per capita and total country employment. Using year as a dummy variable served as yet another control. These controls are also established in the theoretical framework provided in the background section and account for macroeconomic elements that could adversely affect the outcomes of the hypothesis testing.

In the empirical analysis, the first two hypotheses utilized multiple linear regression to ensure the inclusion of control variables, while the latter two hypotheses required a multiple linear regression that accounted for both the interaction term between the independent variable and moderating variable as well as the control variables. The initial findings of the research study suggested that only part-time employment has a positive, statistically significant impact on ICT patent output. Hypothesis one yielded results that suggested that temporary employment actually had a negative effect on ICT patent output, but the regression analysis was not statistically significant. The latter two hypotheses demonstrated a positive impact of the interaction term on the dependent variable; however, these results were also not statistically significant. In turn, only hypothesis two could be supported with quantitative evidence that fulfilled the statistical requirements of the regression model analysis.

When evaluating the initial findings of the study, I determined that the total country employment control variable was redundant in the model as this statistic was already accounted for with GDP per capita—a far more comprehensive indicator of economic size and power. To ensure that the validity of the study remained intact, I did not engage in “p-hacking”, or selective reporting of

results, and thus reexamined the regression model in the discussion section of this work without total country employment as a control variable. The results from this secondary analysis yielded significantly different results.

With the secondary analysis, the first hypothesis showed that there is a positive, statistically significant relationship between temporary employment and ICT patent output, which permitted the rejection of the null hypothesis. Support for the second hypothesis also increased with the secondary analysis. Additionally, hypothesis three demonstrated a positive, statistically significant relationship between the interaction term and the dependent variable, which further supports the argument that temporary employment facilitates stronger digital innovation output. Lastly, the testing of the fourth hypothesis showed that there is a positive relationship between the interaction term and the dependent variable, but it was not statistically significant.

This empirical portion of the study provides support for the theoretical model, which states that alternative contractual employment, i.e. temporary or part-time employment, yields greater ICT patent output in a specific country's economy. On a microeconomic lens, this suggests that employee procurement strategy that does not follow a traditional rigid format increases the innovation output of the firm. These findings contradict some of the literature that suggests that labor market flexibility decreases innovation and supports the literature that asserts the belief that higher labor market turnover rates, employee autonomy, and firm leanness encourage innovation. Ultimately, it is immensely difficult, if not impossible, to account for all of the numerous factors that impact all of the inputs that drive innovation; however, it is evident from this study that temporary and part-time employees can, and do, yield higher levels of innovation than traditional employees under a permanent, full-time contract.

7.3 Suggestions for Further Research

Although there already exists abundant literature surrounding employee procurement strategy, labor market flexibility, and digital innovation, further research is required to explore more fully how these underlying considerations drive innovation, particularly in industries that rely heavily on digitalization. This study utilized longitudinal, archival data that gauges through a

macroeconomic lens the impact of employee procurement strategy on digital innovation. There are benefits to taking this approach; however, the limitations that remain must not be overlooked.

It would profit future research initiatives into this topic to establish specific independent, dependent, and control variables that relate explicitly to a population composed of firms within an industry that relies heavily on digital innovation. This would provide a microeconomic perspective on how various firm-level employee procurement methods specifically impact digital innovation. Additionally, this form of research would need to draw on extensive correlational surveying and would therefore require the resources necessary to execute this task systematically and effectively. Furthermore, firm-level data would permit the researcher(s) to control for firm size, industry, structure, and numerous other factors that cannot be evaluated or accounted for at the macroeconomic level. This surveying would also provide the opportunity to investigate more thoroughly the data through an exploratory factor analysis rather than mining archival data that has not been collected first-hand. Since innovation is a difficult dependent variable to measure, much of the research relating specifically to innovation relies on archival survey data. Therefore, any research initiatives seeking to undertake a comprehensive understanding of employee procurement strategy on digital innovation would require access to firm-level data and provision of adequate resources.

Further research could also benefit from the implementation of an independent variable in each hypothesis that more explicitly addressed procurement whether derived from correlational surveying methods or deeper mining into archival data that exists. One such example could be the percentage of multinational corporation employees that are directly outsourcing or insourced. Deriving a statistic for in-house outsourcing would be the most challenging option; however, it would yield the most directly telling results regarding the value of this human capital procurement strategy.

Additionally, examining the specific relationships that exist in the interaction terms is something that would enhance this research significantly. Results of the second round of regression analyses demonstrated that job tenure had an adverse impact upon part-time employment, which could

suggest that temporary labor generates more innovation only when it is full-time. This would need to be explored more deeply to truly derive support for such a hypothesis.

In summary, the overall findings of this research proved to be both interesting and insightful; however, additional questions emerged during the course of this work. It is my hope that future researchers will seek to replicate this study and fill in some of the gaps that continue to exist within the literature associated with digital innovation.

8 Conclusions and Recommendations

The practical implications that can be derived from this work on digital innovation and employee procurement strategy are far reaching for both the public and private sector. Governmental agencies and companies alike rely heavily on digital innovation to further their directives in the twenty-first century. One resounding takeaway from the theoretical framework in this research is that the most valuable asset to a highly innovative firm is its human capital. The knowledge management literature discusses the vitality of maintaining strong relationships with employees while simultaneously permitting workers the autonomy to engage in continuous innovation. This theory must be applied to any firm—public or private—that aims to develop user-friendly, innovative applications in the digital frontier ahead.

The rise of the "gig-economy" is facilitating an enormous growth in independent contracting, which most definitely facilitates temporary contractual employment. It is vitally important, however, that when a firm contracts for the purpose of communal application development, or other highly technical projects, that all of the employees who are cooperating with one another also be in the same physical space for at least a portion of the contractual work period. It is immensely difficult, even in highly digitalized industries, for employees whose assigned initiatives require active collaboration to function optimally out of an exclusively remote environment.

Quantitative and theoretical findings suggest that temporary employment contracts yield the greatest innovation output for firms in the information communication technology sector, which suggests that high turnover rates of full-time employees should be included in human capital procurement strategy. Part-time labor, when paired with a short job tenure, does not yield the same productivity that temporary, full-time employees or permanent, part-time employees do.

Furthermore, the relevant implications are vital for developing a strong company culture that supports employees. The positive relationship between temporary employee procurement and digital innovation output requires that the employee is committed to the organization. Without this dedication, the employee is unlikely to invest the time and energy that is necessary to

innovate beyond the basic requirements of the job. Firms that truly facilitate exceptional innovation promote such an atmosphere in the workplace.

Ultimately, the findings herein suggest that alternative contractual employment strategy can be beneficial for a firm or organization desiring greater digital innovation output, but individual company culture, structure, and directive must be taken into account before the implications of this study can be specifically applied. This work suggests that organizational management must consider the benefits and consequences of different human capital procurement strategies to best determine how to utilize traditional or alternative contractual labor agreements.

Recommendations

1. *Maximize* the number of independent contractors, consultants, and coders that are employed at the Finnish Digital Agency for the purpose of maintaining a lean firm that continues to have new ideas that fuel innovation.
2. *Capitalize* on temporary employment contracts rather than part-time, permanent labor as the contractors will be entirely focused on the work at hand thus yielding stronger, innovative project work.
3. *Strengthen* the policy of bringing third-party employees into the Finnish Digital Agency headquarters as a means of creating camaraderie among members of the workforce and capitalizing on the benefits of "in-house outsourcing."
4. *Foster* a culture of internal entrepreneurship and knowledge creation that encourages temporary employees to both complete projects within their teams and explore new possibilities with individual projects for the purpose of improving user experience in the Finnish digital space.

In conclusion, these four major recommendations are derived from both the theoretical and empirical elements of this work. Already, the Finnish Digital Agency has successfully developed itself into a leader in public sector digital innovation. As the FDA continues to build upon this foundation, however, a more direct focus on human capital procurement strategy would provide additional knowledge to the organization, which constitutes the most valuable resource in fueling digital innovation output.

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